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Biological Evaluation
for the:
Green-Horse Habitat Restoration & Maintenance Project

DRAFT

Shasta Trinity National Forest
National Recreation Area Management Unit
Shasta County, California

Prepared by:_____ **Date:** _____
Patricia Johnson
Wildlife Biologist
USDA Forest Service
VMS Enterprise Unit

Reviewed by:_____ **Date:** _____
Todd Johnson
District Wildlife Biologist
Shasta-Trinity National Forest
National Recreation Area Management Area

Executive Summary

SPECIES	SPECIES STATUS	MANAGEMENT REQUIREMENTS	EFFECTS DETERMINATION
Bald eagle	S	LOP	May impact/NL*
Northern goshawk	S	N/A	May impact/NL*
Willow flycatcher	S	N/A	No effect/no suitable habitat
Pacific fisher	S, C	LRMP S&Gs for snags and downed logs	May impact/NL*
American marten	S	N/A	No effect/no suitable habitat
California wolverine	S, C	N/A	No effect/no suitable habitat
Pallid bat	S	LRMP S&Gs	May impact/NL*
Townsend's big-eared bat	S	250' buffer outside caves	May impact/NL*
Western red bat	S	LRMP S&Gs; no direct ignition in riparian	May impact/NL*
Northwestern pond turtle	S	LRMP S&Gs; no direct ignition in riparian	May impact/NL*
Shasta salamander	S	300' equipment exclusion zone & LOP	May impact/NL*
Foothill yellow-legged frog	S	LRMP S&Gs; no direct ignition in riparian	May impact/NL*
Cascade frog	S	N/A	No effect/no suitable habitat
Southern torrent salamander	S	N/A	No effect/no suitable habitat and outside range
Shasta hesperian snail	S	300' Equipment Exclusion Zone in suitable habitat	May impact/NL*
Shasta Sideband snail	S	300' Equipment Exclusion Zone in suitable habitat	May impact/NL*
Wintu Sideband snail	S	300' Equipment Exclusion Zone in suitable habitat	May impact/NL*
Shasta Chaparral snail	S	300' Equipment Exclusion Zone in suitable habitat	May impact/NL*
Tehama Chaparral snail	S	N/A	No effect/ outside of range

**May impact/NL – May impact individuals, but is not likely to result in a trend towards Federal listing or loss of viability for this species within the planning area of the Shasta-Trinity National Forest. In the absence of a range wide viability assessment, this viability determination is based on local knowledge of this species, most current available science, and professional judgment.*

S = Forest Service Sensitive species; C = Candidate for federal listing

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I. Introduction

The Green-Horse Habitat Restoration and Maintenance project (Green-Horse project) area is located in northern California above Shasta Lake, approximately 20 miles northeast of Redding (see vicinity map below). The project is located on the National Recreation Area Management Unit of the Shasta Trinity National Forest, between the Pit Arm, the Squaw Creek Arm and the McCloud Arms of Shasta Lake. The terrain is steep and rugged, with slopes commonly exceeding 50 percent. Elevation within the project area ranges from approximately 1,065 feet to 4,325 feet.

The Green-Horse project would establish a trend toward the desired conditions as described in the Forest Plan by reducing fuel accumulations on approximately 41,836 acres of national forest land. This would be accomplished using a combination of prescribed broadcast burning or underburning, hand thinning and pruning of small trees and brush followed by hand piling and pile burning. Fuels treatments would occur over a period of 7 to 10 years, and an adaptive management strategy would allow managers to adjust treatments over time if they discover new information or changed conditions. No commercial timber harvest, new forest system or temporary road construction, or existing road reconstruction is proposed with either action alternative.

The legal description of the project area is as follows:

Table 1: Legal description - Green-Horse Habitat Restoration and Maintenance Project

Township (MDM*)	Range	Section(s)
T33N	R3W	1-3
T34N	R1W	6, 7
T34N	R2W	1-12, 15-21, 28-31
T34N	R3W	1, 4-10, 12-33
T34N	R4W	1, 11-14, 23-26
T35N	R1W	6, 7
T35N	R2W	3, 4, 8-10, 14, 16, 20-22, 24, 26-36
T35N	R3W	29-33, 36

**MDM = Mount Diablo Meridian*

II. Current Management Direction

A Biological Evaluation (BE) describes the effects of a federal action on species identified as 'Sensitive' by the U.S. Forest Service. This is an internal designation that serves to focus attention on species of concern to the Forest Service and provides a mechanism for evaluating the potential effects of a Federal action on individuals and their populations. The primary concern is at a population level and determines if agency actions are likely to lead to a trend toward federal listing under the Endangered Species Act. The federal action in this case is the Green-Horse Habitat Restoration and Maintenance Project (Green-Horse Project). The purpose of this Biological Evaluation is to document analysis of the potential effects resulting from the Green-Horse project on the animal species listed for the Shasta-Trinity National Forest from the Regional Forester Sensitive Species List (a.k.a. Forest Service Sensitive species).

Appendix C includes updates to the FS Sensitive Species list and analyzes the additional species added to the list that have the potential for effects from the proposed project.

Land Allocation & Management Prescription

Management prescriptions apply a management theme to specific types of land. Within the general framework of the Shasta-Trinity Forest Land and Resource Management Plan (LRMP) Standards and Guidelines, specific activities are identified that are to be emphasized or permitted on that land and associated standards and guidelines. A description of allowable activities within specific management prescriptions can be found in the Shasta-Trinity National Forest (STNF) LRMP. [1] Standards and guidelines for proposed actions must also be consistent with the Record of Decision (ROD) and Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth-Related Species within the Range of the Northern Spotted Owl.

The project area consists of seven management prescriptions and four land allocations as described in the STNF LRMP: Limited Roaded Motorized Recreation, Roaded Recreation, Wildlife Habitat Management, Late-Successional Reserve, Commercial Wood Products, Riparian Reserve, and Special Management Area – RNA. Approximately two-thirds of the proposed treatment areas are located within two prescriptions: Limited Roaded Motorized Recreation and Roaded Recreation[2].

Land allocations and management prescriptions most pertinent to this analysis because of their application to the management of Forest Service Sensitive species are Late Successional Reserve (LSR), Managed Late Successional Area (Madrone MLSA) and Wildlife Habitat Management. Total acres proposed for treatment are categorized by land allocation for each alternative in Table 2 below.

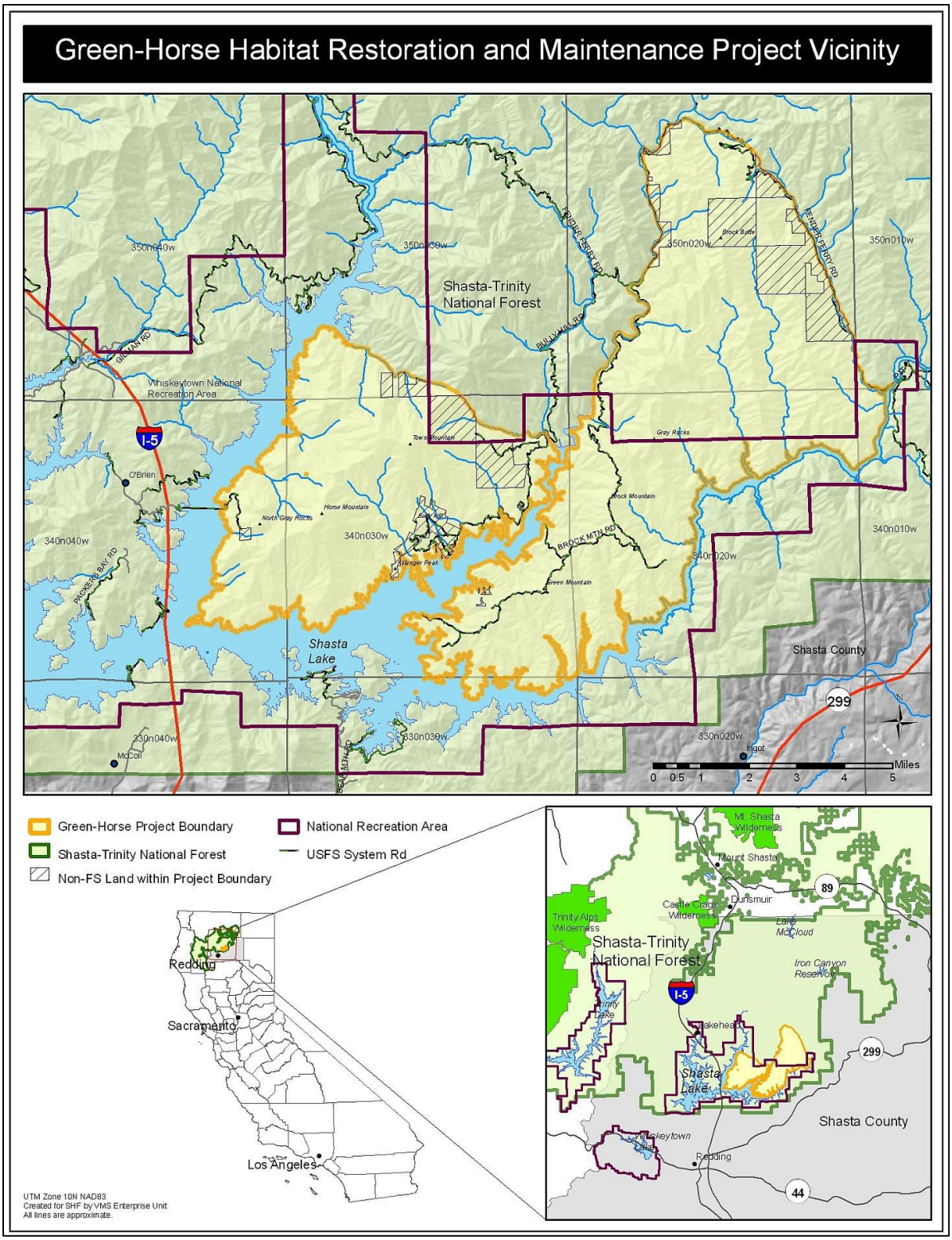
Table 2: Proposed treatment acres and treatment percentage by Forest Plan land allocation

ALTERNATIVE 2			
Administratively Withdrawn Areas	**Matrix Lands**	**Late Successional Reserves**	**Riparian Reserves**
21,980 ac	15,663 acres	4,173 acres	[14,476 acres*]
53%	37%	10%	N/A*
ALTERNATIVE 3			
5,378	5,828	2,069	[4,944]
40%	44%	16%	N/A*

*Riparian reserve acres occur within other prescriptions and are not counted as part of the total acreage.

1 LRMP, Shasta-Trinity NF LRMP, 1995, pp. 4-37 to 4-44

2 The Riparian Reserves management prescription occurs within the other management prescriptions.



Map 1: Green-Horse Project Vicinity Map – Alternative 2 Proposed Action

III. Proposed Activities

Alternative 1

Alternative 1 is the no-action alternative. If this alternative is selected, no fuels treatments would occur and there would be no need to amend the Forest Plan. Current management and uses of the National Forest System lands in the project area would continue. This alternative represents the existing conditions of the project area and the progression of these conditions that would occur naturally over time if no management actions are implemented. This alternative provides a baseline of conditions for comparison of potential effects of the action alternatives.

Alternative 2 - Proposed Action

The Green-Horse project would establish a trend toward the desired conditions as described in the Forest Plan by reducing fuel accumulations on approximately *41,836 acres*. The actions summarized below are proposed in order to address the underlying purpose and need[3] in the project area:

- Prescribed broadcast burning or underburning would occur on approximately 41,622 acres.
- Hand thinning and pruning of small trees and brush, followed by hand piling and pile burning or underburning, would occur on approximately 92 acres adjacent to private property.
- Hand thinning and pruning of small trees and brush, followed by hand piling and pile burning, would occur on approximately 35 acres surrounding recreation residences at Campbell Creek.
- Hand thinning and pruning of small trees and brush, followed by hand piling and pile burning or underburning, would occur on approximately 83 acres surrounding bald eagle nest sites.
- Approximately 4.61 miles (4 acres) of dozer line would be reconstructed in order to assist fire managers in safely conducting prescribed fire.

This alternative includes 41,836 acres of fuels treatments that would be accomplished over a 7 to 10 year period using an adaptive management strategy. It would require amending the Forest Plan to change down wood requirements in order to achieve our fuel reduction objectives and protect soils in specific management prescription areas. There would be no commercial timber harvest and no new road construction or road reconstruction. The overall goal is to create a landscape that would provide fire managers more options in the future to allow fire to play its natural role in the ecosystem.

Prescribed underburns would be applied on 41,622 acres in a mosaic pattern, with some portions of areas likely remaining unburned due to low fuel concentrations. The initial application of prescribed fire would be designed to remove live and dead vegetation on the ground as well as lower branches of trees to prevent a wildfire from spreading from the ground into the forest canopy. An average of 30 to 60 percent of brush and browse cover—much of which is currently overgrown and unpalatable to wildlife—would be burned in up to two separate prescribed fire applications per treatment area to stimulate new growth.

In riparian reserve areas, prescribed fire would be of low intensity with no more than 10 percent of the area receiving a moderate-intensity burn. Moderate-intensity burns in riparian reserves are considered acceptable when used with design features that are intended to protect soils and other

[3] 40 CFR 1502.13

resources (see the proposed design features for hydrology, fisheries, and soils in Chapter 2 of the project EIS).

Fire crews would construct firelines by hand where natural barriers do not exist and these would provide a starting point for ground-based ignitions and holding crews. In addition, approximately 4.61 miles (approximately 4 acres) of 8-foot-wide dozer lines would be constructed or improved in order to facilitate the implementation of prescribed fire.

Crews would ignite prescribed fires on the ground with handheld torches or from the air using helicopters. Prescribed fire may be conducted any time of year as long as it is outside of site specific Limited Operation Periods and prescriptions addressed within a site-specific burn plan. Desired flame lengths in the treatment areas would vary from 0 to 8 feet within the threat zone of the wildland-urban interface and as resource objectives require in other areas.

On approximately 83 acres around identified bald eagle nest sites, a combination of hand thinning, brush cutting, pruning, piling, and burning of hand piles would be accomplished to reduce fuels that could contribute to a crown fire in order to protect current and future bald eagle nest sites from a severe wildfire. Desired flame lengths in these treatment areas range from 0 to 4 feet. Treatments would extend approximately 300 feet around the perimeter of identified nest sites and would not be completed during the season when bald eagles are nesting unless otherwise approved by the district wildlife biologist (see Project Design Features below).

Alternative 3

This alternative was developed in response to comments requesting that Forest Plan standards are followed for dead and downed wood throughout the project area – in essence, the Forest Plan amendment proposed in Alternative 2 is not implemented. A total of 13,275 acres would be treated with this alternative (13,247 acres of prescribed burning and 28 acres of hand treatments – see table 3 below).

A preliminary analysis indicated that, of the 26,284 acres within Management Prescriptions II and III (for which the amendment was proposed), only about 4,712 acres currently meet Forest Plan standards for dead and downed wood. Of those acres, only about 6 acres would meet Forest Plan standards following treatment. As a consequence, the IDT dropped all of the lands in those two management prescriptions from proposed fuels treatment under Alternative 3. In addition, portions of other management prescriptions were also dropped because they were scattered and isolated from the remainder of the project area and/or too small to warrant treatment.

In addition, no dozer line would be constructed under this alternative, and no fuels treatment would occur around known bald eagle nest sites or the Campbell Creek recreation residences.

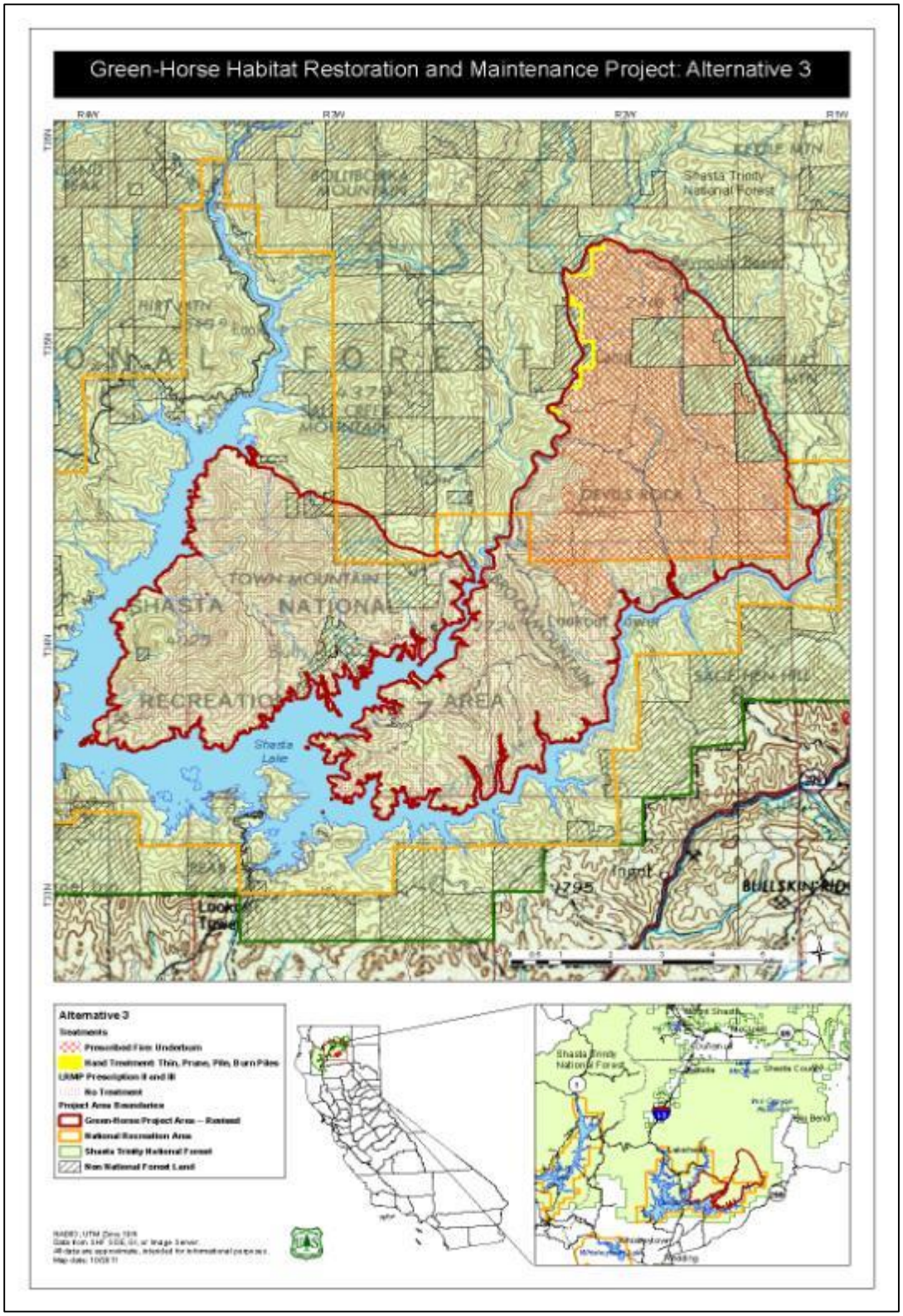


Figure 1. Green Horse Project - Alternative 3

Table 3: Proposed Action and Alternative 3 by Treatment Type and Land Allocation (all treatments)

ALTERNATIVE 2				
Proposed Action -- Treatment Type by Land Allocation	Hand Treatment: Thin, Prune, Pile, Burn Piles	Prescribed Fire: Underburn	Dozer Line	Totals
Matrix	132	15,550	2	15,684
Late Successional Reserve	37	4,136		4,173
Administratively Withdrawn	39	21,938	2	21,979
Totals	208	41,625	4	4,1836
ALTERNATIVE 3				
Proposed Action -- Treatment Type by Land Allocation	Hand Treatment: Thin, Prune, Pile, Burn Piles	Prescribed Fire: Underburn	Dozer Line	Totals
Matrix	21	5,807	0	5,829
Late Successional Reserve	5	2,064	0	2,069
Administratively Withdrawn	2	5,376	0	5,377
Totals	28	13,247	0	13,275

Treatment types are categorized by management prescriptions pertinent to the analysis within this Biological Evaluation in Table 4 below. Other management prescriptions have proposed treatments, but these prescriptions are not pertinent to this analysis.

Management prescription VII (Late Successional Reserves) "is to be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl. These reserves are designed to maintain a functional, interacting, late-successional and old-growth forest ecosystem."[4] However, it is important to note that the management prescription VII is generally applied to LSRs as described above, but on the NRA Management Unit it has multiple sub categories that apply to the management of Threatened, Endangered, or FS Sensitive species as well (e.g. LSRs established around bald eagle and peregrine falcon nesting areas). There are multiple areas within the project area that are indicated as LSR, but are not late successional *habitat*. See Map 1 in Appendix A for an illustration of this.

Management prescription VI (Wildlife Habitat Management) emphasizes habitat management for early and mid-level seral stage dependent species. Forest stands in wildlife emphasis areas are managed to maintain lower tree stocking levels and greater amounts of understory cover/forage ratios. The landscape within this area is openings of early seral stage plants and trees to open mature stands often containing multiple understory layers of trees and shrubs. This prescription area includes many areas of hardwood types[5]. In addition, direction also includes managing existing hardwood types to maintain or improve stand health and wildlife habitat[6].

Managed late-successional areas (MLSA) "are similar to Late-Successional Reserves but are identified for certain owl activity centers on the eastside where regular and frequent fire is a natural part of the ecosystem. Certain silvicultural treatments and fire hazard reduction treatments are

[4] STNF LRMP p.4-41
[5] STNF LRMP Chap.4
[6] STNF LRMP Chap.4

permitted to help prevent complete stand destruction from large catastrophic events such as high intensity, high severity fires or disease or insect epidemics"[7].

Table 4: Proposed Action and Alternative 3 treatment acres by Forest Plan management prescription pertinent to the Biological Evaluation and treatment type

ALTERNATIVE 2			
Forest Plan Management Prescription	**Prescribed Fire: broadcast burn or underburn (acres)**	**Hand Treatment: thin / prune / pile / burn piles (acres)**	**Dozer Lines (miles)**
Wildlife Habitat Management (VI)	5,778	21	0
Late-Successional Reserve (VII) TOTAL = 4,173			
7E LSR established to manage known eagle sites8	1,371	29**	0
7F LSR established to manage known peregrine falcon site	1,469	3	0
7M Managed Late Successional Area (MLSA)	1,296	5	0
Riparian Reserve (IX)	[15,517]*	[88]*	[0]*
ALTERNATIVE 3			
Wildlife Habitat Management (VI)	5,608	21	0
Late-Successional Reserve (VII) TOTAL = 2,069			
7E LSR established to manage known eagle sites	0	0	0
7F LSR established to manage known peregrine falcon site –	769	0	0
7M Managed Late Successional Area (MLSA)	1295	5	0
Riparian Reserve (IX)	[4,933]*	[11]*	[0]*

*Riparian reserve acres occur within other prescriptions and are not counted as part of the total acreage.

**Not all bald eagle treatment areas are within areas designated as LSR in the LRMP; the remaining 54 acres proposed for treatment in Alternative 2 occur within known bald eagle territories that are not LSRs.

Fuels Objectives

Historically, approximately 73 percent of the analysis area supported vegetation at or below a fire return interval (FRI) of 20 years. Given the historical FRI, the process to re-establish fire's natural role is estimated to be between 40 and 60 years without any management influence – including

[7] STNF LRMP p.4-42

[8] This area is also subject to LOPs for bald eagles: January 1 to July 31 on all activities within 0.25 mile of known nest sites that would generate noise above ambient levels, and all smoke-generating activities would be prohibited within 0.25 mile of known nest sites.

prescribed fire and suppression of wildfires[9]. Nevertheless, suppression of wildfires will continue under current policy and direction making it nearly impossible for fire to return to its historical role in the ecosystem without the use of management actions like what is proposed through this project[10].

The moderate conditions under which prescribed fire would be implemented would safely reduce accumulated fuels as well as increase age class diversity. The proposed activities will reduce the total fuel available in the treated areas by as much as 63 percent, with dead material ≥3" diameter predicted to be reduced by as much as 58 percent, trending the project area towards an historical range of variability of fire occurrence and severity and the desired condition[11].

The large, diverse project area with a multitude of vegetative conditions limits our ability to predict the amount of snag and downed logs consumed per acre in the proposed project area. Subsequently, current conditions on the ground are the strongest predictor of the amounts of downed wood and snags that would remain after treatment. Project activities target smaller size classes for burning and these size classes (3" and greater) are the first to be consumed during moderate fire conditions.[12] The proposed burning is not likely to dramatically reduce the large downed wood and snags (as defined for purposes of habitat suitability as ≥24"dbh) where these elements currently exist, as in the northern portion of the project area[13].

Where the current vegetation type is brush and smaller diameter trees, a higher proportion of the downed wood would be consumed during implementation. Snags would be both created and consumed with a given treatment area, with fuel modeling predicting that size class ranges for snags will be similar to the residual live stand and the particular number of snags on a specific site will be closely related to the level of stocking.[14]

The area affected by active crown fire (see 'Modeling Outputs' below) predicts the effects to canopy closure. The likely intensity of the fire behavior (as measured by flame length) predicts the potential impacts to understory components of the habitat. Fire behavior specialists modeled both the likelihood of the project area to generate active crown fire and the potential flame length during project implementation, during a post-treatment wildfire, and during a wildfire if no treatments are implemented. Tables 5, 6, and 7 below describe the results of this modeling.

[9] Green-Horse Fire-Fuels/Air Quality/Vegetation Report
[10] Green-Horse Fire-Fuels/Air Quality/Vegetation Report
[11] Green-Horse Fire-Fuels/Air Quality/Vegetation Report
[12]Green-Horse Fire-Fuels/Air Quality/Vegetation Report
[13] Green-Horse Fire- Fuels/Air Quality/Vegetation Report
[14] Green-Horse Fire- Fuels/Air Quality/Vegetation Report

Modeling Outputs[15]
Flame length Serves as a measure of how intense a fire may become and as a proxy for ease of fire suppression to model and predict fire behavior. Flame lengths are described in the Fire Management Plan and Appendix B of the Fireline Handbook[16] and are defined as follows: Very Low – Non-flammable areas such as rock outcropping, water, etc. Low – Flame lengths 0 to 4 feet. Tactics using hand tools can generally attack fires at the head or flanks of the fire with success. Moderate – Flame lengths 4 to 8 feet. Fires are too intense for direct attack on the head of the fire with hand tools. Equipment such as dozers, engines and retardant aircraft can be effective. High – Flame lengths 8 to 12 feet. Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective. Very High – Flame lengths greater than 12 feet. Fires present serious control problems and control efforts are typically ineffective. Crown fire potential This is a measure of how intense or extreme a fire may become under specified conditions. Canopy characteristics (e.g. canopy base height, canopy bulk density, stand height, and foliar moisture content), ladder fuels, and fuel loading are all factors that determine crown fire potential. The model assumes uniform canopy characteristics and makes independent fire behavior calculations for each raster landscape (90 m X 90 m cell). Crown fire measures are defined as the following: Surface fire -- The fire remains on the forest floor. The combination of surface fire intensity and ladder fuels is not sufficient to move a fire into the crowns under the defined burning conditions. Passive Crown Fire -- Individual tree or group torching occurs. The combination of surface fire intensity and ladder fuels allows for movement into the crowns under the defined burning conditions, but canopy bulk density is too low for fire to spread through the crowns under the projected wind speeds. Active Crown Fire -- The combination of surface fire intensity, ladder fuels and canopy bulk density allows fire to move into, and spread through, the crowns under the defined burning conditions.

[15] Green-Horse Fire- Fuels/Air Quality/Vegetation Report
[16] NWCG 2006

Table 5: Crown Fire and flame length potential for prescribed fire and post-treatment wildfire (90th percentile) parameters for the Green-Horse project area17 under the Proposed Action.

Prescribed Fire	**Crown Fire Potential (acres, %)**	**Unburned**	**Surface Fire**	**Passive Crown Fire**	**Active Crown Fire**	
		241 (<1%)	37,468 (90%)	3,913 (9%)	0 (0%)	
	Flame Length Potential (acres, %)	Very Low	Low	Moderate	High	Very High
		23,270 (56%)	18,118 (43%)	106 (<1%)	30 (<1%)	97 (<1%)
Wildfire (post-treatment)	**Crown Fire Potential (acres, %)**	**Unburned**	**Surface Fire**	**Passive Crown Fire**	**Active Crown Fire**	
		241 (<1%)	36,256 (87%)	3,458 (8%)	1,666 (4%)	
	Flame Length Potential (acres, %)	Very Low	Low	Moderate	High	Very High
		28,716 (69%)	7,740 (19%)	896 (2%)	1,101 (3%)	3,168 (8%)

[17] Green-Horse Fire- Fuels/Air Quality/Vegetation Report

Table 6: Crown Fire and flame length potential for prescribed fire and post-treatment wildfire (90th percentile18) under Alternative 3

Prescribed Fire	**Crown Fire Potential (acres, %)**	**Unburned**	**Surface Fire**	**Passive Crown Fire**	**Active Crown Fire**	
		28,591 (68%)	12,391 (31%)	601 (1%)	0 (0%)	
	Flame Length Potential (acres, %)*	Very Low	Low	Moderate	High	Very High
		8,891 (21%)	4,337 (10%)	21 (<1%)	6 (<1%)	20 (<1%)
Wildfire (post-treatment)	**Crown Fire Potential (acres, %)**	**Unburned**	**Surface Fire**	**Passive Crown Fire**	**Active Crown Fire**	
		283 (<1%)	21,189 (51%)	2,099 (5%)	18,265 (44%)	
	Flame Length Potential (acres, %)	Very Low	Low	Moderate	High	Very High
		10,087 (24%)	8,291(20%)	446 (1%)	359 (1%)	22,653 (54%)

*Flame length potential under Alternative 3 is disclosed for the acres treated, with the percentage based on the sum of the treated and untreated acres. There is no predicted flame length potential for the untreated (i.e. unburned) acreage during project implementation.

**Flame length potential predicted for a wildfire following implementation of Alternative 3 is disclosed both for the treated and untreated acres, with the percentage based on the sum of the treated and untreated acres.

Table 7: Fire behavior modeled for a wildfire without treatment (No Action Alternative). Current crown fire and flame length potential within the project area under 90th percentile parameters are displayed below.

Crown Fire Potential (acres, %)	**Unburned**	**Surface Fire**	**Passive Crown Fire**	**Active Crown Fire**	
	241 (<1%)	12,855 (31%)	2,462 (6%)	26,064 (63%)	
Flame Length Potential (acres, %)	Very Low	Low	Moderate	High	Very High
	499 (1%)	12,064 (29%)	532 (1%)	11 (<1%)	28,516 (69%)

The potential for fire behavior to exceed most ground suppression capabilities in the event of a wildfire is high with approximately 70% of the landscape producing flame lengths greater than 8 feet. Mortality and canopy loss, as portrayed by crown fire potential, is expected to approach 70% as

[18] 90th Percentile Weather Conditions are the highest 10 percent of fire weather days; where, fuel moisture, temperature, relative humidity, and wind speed are only exceeded 10 percent of the time based on historical period of weather observations.

well. These values illustrate the difficulty that fire managers will have in suppressing these fires and the increased probability of resource damage. Predicted fire behavior values for a future wildfire event occurring under 90th percentile conditions are outlined in Table 7.

IV. Project Design Features - Wildlife

Northern spotted owls

- Limited operating period is from February 1 to July 10 on all activities that would generate noise above ambient levels; and all smoke-generating activities would be prohibited within 0.25 mile of known nest cores and unsurveyed, suitable nesting/roosting habitat.
- Maintain existing snag and large down log levels across the landscape where fuel loading is not excessive; do not go below Forest Plan standards for snags and logs per acre.
- Within occupied or unsurveyed suitable habitat, no more than 50 percent of the nesting, roosting, or foraging habitat would be burned or mechanically treated in a single year in any one 7th-field watershed up to 3,500 acres in size.

Bald eagles

- Limited operating period is from January 1 to July 31 on all activities within 0.25 mile of known nest sites that would generate noise above ambient levels and smoke-generating activities within 0.25 mile of known nest sites. This limited operating period may be lifted after consultation with the district wildlife biologist based on site-specific assessment of individual bald eagle nest sites.

Sensitive bat species

- No noise-generating or habitat modification activities would take place within 250 feet of caves, mine shafts and mine adits to protect known or potential Townsend's big-eared bat and other bat species roost sites.
- No activities will occur that would modify the trees or vegetation outside the entrance of the cave for a distance of 250 feet, to protect the microclimate within the cave.

Shasta salamander and terrestrial mollusks

- No line construction during times of potential surface activity within 300 feet of limestone outcroppings, as determined by the district wildlife biologist and the Shasta salamander survey protocol.
- No mechanized equipment or pile construction within 300 feet of limestone outcroppings. Only hand line will be constructed within 300 feet of limestone outcroppings or known occupied sites.
- No treatment would be permitted within 100 feet of springs or perennial seeps (*Shasta hesperian habitat)*.

V. Methodology and Bounding

Spatial and Temporal Bounding

Spatial

The project area has also been delineated for the fire/fuels specialists by HUC8 boundaries for the purposes of analyzing treatments and creating burn plans using logical boundaries. See Map 1 in Appendix A for a project area map, including the HUC8 boundaries,

Project Area: *"Project area"* refers to the defined area that encompasses all the treatment units using logical, on-the-ground boundaries.

Treatment Unit: The term "*treatment unit"* will indicate the HUC8 identified for burning within the project area boundary. Each unit would be burned using site specific parameters tailored to fit each unit's resource needs and concerns. "*Treatment unit*" also indicates those areas proposed for hand treatment.

Action Area: The "*analysis area"* encompasses the area within 0.25 miles of the treatment units in addition to the treatment units themselves. However, the entire project area is divided into adjacent HUC8 treatment units, such that a buffer around one treatment unit would overlap into the adjacent treatment unit and involve a degree of unnecessary redundancy. Essentially, the project area is one large treatment unit, so a 0.25 mile buffer around the project area was analyzed, in addition to the habitat within the project area boundary itself.

This bounding will capture the area potentially affected by noise disturbance (up to 0.25 mile from the source of noise above ambient levels), and the area potentially affected by smoke (up to 0.25 mile from treatment units or within the drainage feature).

Temporal

Temporal bounding is two-part:

Short-term: Bounding the analysis at the time of implementation (5-10 years) captures the potential disturbance-oriented, immediate impacts from project implementation such as smoke or noise.

Long-term: Bounding the analysis at approximately 20 years[19] permits us to model ecological conditions for the time needed post-treatment to restore the natural fire cycle.

Long-term temporal bounding will take into account the beneficial effects garnered from the reintroduction of fire into the ecosystem. This bounding also incorporates time needed for the re-establishment of the understory components such as duff, litter and large woody debris and any structural components that may have been lost to fire within the lower layers of the understory.

A table showing past actions and known natural events (primarily wildfires), ongoing actions, and proposed projects within the Green-Horse project area is provided in Appendix B in order to provide a context for current environmental conditions within the project area.

[19]Green-Horse Fire/Fuels/Vegetation/Air Quality Report; Newburn, B. 2011 Personal communication.

Selection of Species to be Analyzed

Region 5 Forest Service Sensitive Species

This BE follows the standards established in Forest Service Manual direction (FSM 2672.42). The Shasta-Trinity National Forest provided the Region 5 Forest Service Sensitive list for the Shasta-Trinity National Forest; see Appendix C for updates to this list pursuant to the 2013 updated Regional Forester's Sensitive Species List.

Birds	
northern goshawk	*Accipiter gentilis*
willow flycatcher	*Empidonax traillii*
bald eagle	*Haliaeetus leucocephalus*
Mammals	
pallid bat	*Antrozous pallidus*
Townsend's big-eared bat	*Corynorhinus townsendii*
western red bat	*Lasiurus blossevillii*
California wolverine	*Gulo gulo luteus*
American marten	*Martes americana*
Pacific fisher	*Martes pennanti pacifica*
Amphibians	
southern torrent salamander	*Rhyacotriton variegatus*
foothill yellow-legged frog	*Rana boylii*
Cascade frog	*Rana cascadae*
Shasta salamander	*Hydromantes shastae*
Reptiles	
northwestern pond turtle	*Emys marmorata*
Terrestrial Invertebrates	
Shasta sideband snail	*Monadenia troglodytes troglodytes*
Wintu sideband snail	*Monadenia troglodytes wintu*
Shasta chaparral snail	*Trilobopsis roperi*
Tehama chaparral snail	*Trilobopsis tehamana*
Shasta hesperian snail	*Vespericola shasta*
Big Bar hesperian snail	*Vespericola pressleyi*
Insects	
western bumble bee	*Bombus occidentalis*

Species Dropped from Further Analysis

The following Forest Service Sensitive species were ***eliminated from further analysis*** in this document for the reasons discussed below:

Willow flycatcher, California wolverine, American marten, Cascade frog, and southern torrent salamander

The willow flycatcher occupies large wet meadows adjacent to large streams and nests in large clumps of willows separated by openings. Field reviews, along with GIS habitat mapping, revealed

no riparian shrub (specifically willow) habitat of sufficient size and composition as to provide suitable habitat for willow flycatchers within or near the proposed treatment units. Patches of riparian habitat near some of the higher order streams are both too small and of the wrong species composition to accommodate the habitat preferences of this species. This species does not likely occur in the project area and no suitable habitat would be affected. Consequently, there no impacts to habitat for the willow flycatcher are expected from the proposed project.

Wolverines require large expanses of high elevation, subalpine habitat that receive high levels of snow that remains late into the spring[20]. Deep snow is required for successful wolverine reproduction because female wolverines dig elaborate dens in the snow for their offspring. In addition, the presence of increased human activity in an area generally precludes occupancy by this species[21]. The project area is unsuitable for wolverine due to the low elevation, the lack of substantial snow accumulation during winter or spring, and the high human activity in the area.

American marten tend to use high elevation (>4,500 feet), multi-storied mature and old growth conifer (generally red fir or red fir-white fir mix) forests with moderate to dense canopy closure[22]. Habitat consisting of a dense overstory exceeding 70% canopy closure with minimum tree size of 24"dbh with sufficient understory including slash, rotten logs and stumps to provide hiding cover and denning areas.[23] The Shasta-Trinity LRMP Habitat Capability Models describe habitat guidelines for marten as: late seral, older stands, 5,000' -8,000' elevation. Marten are not expected to be present in the project area, due to its low elevation and unsuitable vegetation composition.

The **Cascade frog** is a montane species found in the Olympic Peninsula, Washington, and in the Cascade Range of Oregon, Washington, and northern California and generally occurs in high elevation (>3,000 feet elevation) montane meadows, marshes, and ponds. It is often found in relatively small bodies of water rather than in large lakes.[24] This species is generally associated with old growth forests of the Pacific Northwest. [25] The project area does not contain suitable habitat for the Cascade frog, as the area is too low in elevation, with a temperature and moisture regime that is too dry and hot, and does not contain the types of water bodies and microclimates preferred by this species. Therefore, this species is not expected to occur in the project area.

The **southern torrent salamander** seldom ventures away from saturated streamside areas and occurs within a relatively narrow range of physical and microclimatic conditions in humid forest habitats with large conifers, abundant moss, and greater than 80% canopy closure.[26] They are found in and near small, rapidly flowing, well-shaded permanent streams with clear, cold (usually 6 to 10 °C) water, especially in mossy gravel or splash zones of rocky, tumbling brooks and require relatively low ambient temperatures[27]. Thus, the southern torrent salamander demonstrates an ecological dependence on streamside conditions of microclimate and habitat structure that are typically best created, stabilized, and maintained within late seral forests in northwestern California.[28]

The project area is within a temperature and moisture regime that is too dry and hot for this species to tolerate. The microclimate, vegetative composition, and moisture regime preferred by this species

[20] USDI 2010
[21] Banci, V. 1994.
[22] Corn and Raphael 1992.
[23] Buskirk S.W. and Powell RA. 1994.
[24] Blaustein et al. 1995
[25] Blaustein et al. 1995
[26] Blaustein et al. 1995
[27] Blaustein et al. 1995
[28] Welsh, H. and A. Lind. 1996.

are not present in the project area. In addition, Shasta Lake (and the Green-Horse project area) are not within the range of this species as described in current literature[29].

Because of the location of the project outside the ranges of and/or the lack of habitat for the Forest Service Sensitive species described above, there will be no further discussion of effects in this analysis, other than in the determination.

Species carried forward in the analysis

The following Region 5 Forest Service Sensitive Species have been analyzed using the best available science. These species are addressed below based on whether the project is within the species' range, the presence of suitable habitat within the analysis and/or project area, or current or historical locations within or near the project area.

Bald eagle, northern goshawk, Pacific fisher, Shasta salamander, northwestern pond turtle, **foothill yellow-legged frog, western red bat, Townsend's big-eared bat, pallid bat, Shasta chaparral, Shasta sideband, Wintu sideband,** and **Shasta hesperian**

Habitat Analysis Methodology

The best available vegetation data was used to provide estimates of available habitat within the project area, which included the EVEG 2007 database (Remote Sensing Data), in conjunction with aerial photography (using the 2009/2010 National Agricultural Imagery Program (NAIP) imagery), field verification, and knowledge and expertise of district and forest personnel. Field reconnaissance was conducted during numerous visits from October 2009 to October 2011.

Attributes within the EVEG database used for this query are described below. It is acknowledged that other aspects of habitat combine to define whether an area is suitable for a particular species, such as the presence of defect and decay in the stand, large downed logs and snags, and the presence of water in appropriate distance and juxtaposition to stands that contain these attributes[30]. These habitat elements cannot be queried from the EVEG data, though they were assessed through field evaluation, aerial photography and discussions with field personnel familiar with the project area vegetative conditions. Therefore, the actual quantities of each habitat type and their subsequent suitability for a particular species may be somewhat overestimated, but will suffice for the purposes of this analysis because the fundamental function of each habitat type would not be changed with the proposed activities. Abiotic factors are also significant to the consideration of suitability and will be discussed in the Effects Analysis below, within the context of the likelihood of a species to occur in areas proposed for treatment.

For Mid and Late-Successional Habitat

An original query using the best available vegetation data was conducted for the Biological Assessment (BA) to establish estimates of available northern spotted owl (NSO) habitat. Habitat analysis done for this BE uses the data obtained for the NSO habitat analysis in the BA because suitable NSO nesting/roosting, and to some extent foraging habitat, is generally considered representative of most of the habitat components preferred by species associated with mature and late successional forests, such as the Pacific fisher and northern goshawk.

However, fisher in the Shasta Lake area appear to be more tolerant of a wider variety of tree species composition and successional stages than generally found elsewhere in their range, based on the numerous detections around the Shasta Lake area. Therefore, a broader range of tree species and

[29] Amphibiaweb 2012
[30] USFWS 2011; pg A-10

vegetative cover was used to estimate habitat for fisher than for goshawk, as described below. Consequently, a higher proportion of the project area was deemed suitable for fisher than for goshawk, though it may likely be an overestimation, as specific habitat preferences for fisher in this area are not known.

For goshawk habitat:

EVEG 2007 data was queried for estimates of habitat with the following stand attributes:

Late-Successional Habitat:

- Canopy cover ≥60%
- Tree size class ≥20" QMD
- Hardwood canopy ≤ 40% hardwood
- Conifer tree species of Douglas fir, Douglas fir-white fir, mixed conifer-pine

Mid-Successional Habitat:

- Canopy cover >40%
- Tree size class of 11.9" to 19.9" QMD
- Hardwood canopy ≤ 40% hardwood
- Conifer tree species of Douglas fir, Douglas fir-white fir, mixed conifer- pine

For fisher habitat:

EVEG 2007 data was queried for estimates of habitat with the following stand attributes:

Mid and Late-Successional Habitat:

- Canopy cover >40%
- Tree size class ≥11.9" QMD
- Tree species present in the project area suitable for *fisher*: Douglas fir, Douglas fir-white fir, Douglas fir- ponderosa pine, mixed conifer-pine, ponderosa pine, black oak

For Limestone Habitat:

Habitat for limestone associated species such as the Shasta salamander and multiple terrestrial mollusks was identified using the Shasta-Trinity NF geology and soils GIS layer, queried for limestone formation bedrock present in the project area. Other variables such as vegetative species composition, position on slope, overstory cover, and overall size of the limestone outcrop are also used when field verifying habitat suitability for the Shasta salamander and other species associated with limestone areas.

For Riparian Habitat:

There are no distinct riparian vegetation communities within the project area mapped within EVEG. Riparian vegetation is generally found within the forested vegetation alliances as a subcomponent limited to narrow areas adjacent to water features. An approximation of area containing riparian vegetation was analyzed based on proximity to 4th order and larger streams within the project area. In an effort to estimate potential riparian vegetation in the project area, a 150 foot buffer was applied to 4th order streams, and a 300 foot buffer applied to 5th order and higher, using GIS. This produced an approximate number of acres, but it is understood that this figure is likely an overestimation, due to the many other factors that influence riparian vegetation other than proximity to a stream. Riparian vegetation is also discussed in the Botany and the Vegetation reports for this project.

Other habitats:

Other habitats, such as oak woodland and mature ponderosa pine, pertinent to this Biological Evaluation (i.e. habitat for the FS Sensitive species described above) were identified within the Vegetation Report for this project using EVEG 2007 and are described below. The remaining habitat types within the project area that do not apply to FS Sensitive species are described in further detail in the Vegetation report and the Wildlife Specialist report for this project.

Species Location Information

For information on current and historical detections and known occurrences for the species described above, the Shasta Lake district records and Shasta-Trinity NF biological data GIS layers (NRIS) were used in addition to the California Natural Diversity Database (CNDDB; a continually updated inventory of rare plants and animals in California, maintained by the California Department of Fish and Game).

VI. Existing Environment

Species composition within the project area follows elevation and temperature gradients ranging from white fir forests at the higher, slightly cooler areas in the northeast portion of the project area, to ponderosa pine/gray pine/knobcone pine/chaparral in the lowest, hottest areas at the southwestern portion of the project area. Vegetation communities in the project area are predominantly mixed conifer and hardwood forests that are considered foothill/lower montane vegetation types based on the elevation range and species mix. Roughly 90% of the project area is forested. The remaining 10% of the project area consists of brush species such as manzanita, chinquapin and various *Ceanothus* species in addition to herbaceous and non-vegetated areas.

As described in the Green-Horse project EIS, a century of aggressive fire suppression and other past management activities has caused dramatic departure from historic fire return intervals across large portions of the project area. This means that the period between successive wildfires (historically every 3 to 40 years) is becoming longer. Most of the Green-Horse project area has missed three or more fire return intervals since suppression began on the Shasta-Trinity National Forest.

This longer fire return interval has resulted in the accumulation of abnormally dense surface and ladder fuels, increasing the likelihood of high-severity fires that consume large areas of forest. The continued accumulation of unburned fuels increases the risk that future fires will be more difficult to suppress, have extreme fire behavior, and rapid, uncontrolled growth similar to that of recent wildfires adjacent to the project area. The lack of more frequent natural fire has caused forest vegetation to become denser and less structurally complex over the past century, with a resulting decline in the species composition and structural diversity of the wildlife habitat.

Habitat types within the Green-Horse project area that are suitable for the FS Sensitive species analyzed within this BE are mid and late successional coniferous forests, limestone outcroppings and adjacent vegetation, stands of large ponderosa pine near the shoreline of Shasta lake, oak woodlands, and riparian habitat. While other habitats types are present in the project area, these will not be discussed within this BE, as they would not be pertinent to the analysis of FS Sensitive species.

The following table from the project Vegetation Report represents the broad categories assigned to vegetation alliances within the project area.

Table 8: Forested Vegetation Types in the project area – seral stage and canopy cover class by alliance type (in acres). Figures in purple font display acres of mid (26,480 acres) and late (3,850 acres) successional fisher habitat.

Seral Stage	Canopy Cover Class	Conifer Forest/Woodland*							Hardwood Forest/Woodland		Subtotals	
		DF	DP	DW	KP	MP	PD	PP	QC	QK	Acres	% of Total
Late seral	Dense	**183**	**407**	**0**	223	**76**	170	**140**	1,233	**2,904**	5,337	14%
	Closed	**0**	**1**	**0**	77	**0**	64	**0**	95	**139**	377	1%
	Open	0	0	0	25	0	116	0	6	18	165	0%
Mid seral	Dense	2,245	13,880	3	74	1,630	136	3,944	2,506	3,949	28,367	75%
	Closed	28	359	0	26	26	39	117	276	299	1,168	3%
	Open	1	43	0	4	1	24	19	66	58	215	1%
Early seral	Dense	57	387	0	106	73	35	96	121	607	1,481	4%
	Closed	0	48	0	26	0	36	14	23	99	247	1%
	Open	0	60	0	45	0	70	8	2	44	230	1%
								Total Forested Acres			**37,586**	**100%**

*DF=Pacific Douglas-fir; DW=Douglas-fir -White fir; KP = Knobcone Pine; MP = Mixed Conifer- Pine; DP=Douglas-fir-Ponderosa Pine; PD = Grey Pine; PP=Ponderosa Pine; QC =Canyon Live Oak; QK= Black Oak

Figure 2. Mid successional habitat in the northern portion of the project area in the Madrone MLSA.

Late and Mid Successional Habitat within the Project Area

Table 9 below displays the acres of late and mid successional conifer habitat that provide potential habitat for fisher and goshawk. Goshawk habitat affiliations in northern California generally match those of the NSO[31]. Therefore, as described earlier, queries of the EVEG data for NSO habitat were used as a proxy for goshawk habitat. Minimal amounts of late successional goshawk habitat are present in the project area, and where present, are juxtaposed in patches interspersed with stands of oak, brush, or mid successional pine. This lack of connectivity is significant to species such as goshawks, and may preclude use of these areas to some extent, as they require larger, more contiguously forested mature conifer forests[32].

Fishers generally have somewhat broader habitat affiliations than goshawk, though in general the preference is for mature, forests with high canopy closure and important habitat elements, such as large downed logs, snags, and water, while specific tree species is of less importance[33]. Therefore, habitat for fisher was estimated using the acres derived in the Green-Horse Vegetation Report for all late successional conifer stands in addition to older stands of black oak (also utilized to some extent by fisher)(see table 8 above). Acres of fisher habitat, while still reflecting the acres of mature forest in the project area, differ from acres of goshawk habitat, as additional forest types are represented.

[31] Zielinski et al 2004; Yeager 2005; Austen 1994; USDI 2010a
[32] Woodbridge and Dietrich 1994
[33] USDI 2010a; Yeager 2005; Zielinski et al 2004; Zielinski et al 2010

Table 9: Total acres of mid and late successional habitat within the project area for goshawk and fisher. Acres differ due to more specific requirements of tree species and vegetation type for goshawk within the broader definition of mid and late successional forest.

Goshawk Habitat*	Project Area
Late-successional *(NSO nesting/roosting)*	301
Mid-successional *(NSO foraging)*	1,011
Fisher Habitat	**Project Area**
Late-successional	3,850
Mid-successional	26,480

*Acres of NSO nesting/roosting and foraging habitat from the BA.

Limestone Habitat

Figure 3. Typical limestone outcropping adjacent to Shasta Lake.

Figure 4. Limestone along the Pit Arm of Shasta Lake

Limestone slopes, outcroppings and caves are present in the watershed and contain suitable habitat for bat species, several terrestrial mollusk species, and Shasta salamanders. From the limestone formations mapped within the forest's GIS geodatabase, there are approximately 3,937 acres of limestone habitat within the project area (inclusive of private land); Alternative 2 contains 3,888 acres and Alternative 3 contains 2,137 acres.

Table 10: Limestone habitat affected by each action alternative[34] and within project area as a whole.

Limestone in Treated Areas (acres)	
Total within project area (inclusive of private land)	3,937
Alternative 2	3,888
Alternative 3	2,137

[34] Dozer line reconstruction does not occur within any of these limestone habitats.

Riparian Habitat

Riparian vegetation present in the project area was approximated at 686 acres adjacent to 4th field and higher order streams. Higher order streams were buffered (using ArcGIS) in order to approximate the riparian habitat present in the project area (as described in the Methodology section above). While this methodology may over estimate habitat in some areas, it provides a reasonable approximation of the riparian vegetation within the project area.

Acres *affected* by the proposed treatments will be substantially less than 686, as not all creeks buffered in the analysis would be affected. In addition, when fire does reach the riparian areas it will be backing down slope from the ridges above and will burn in a low intensity, uneven mosaic, making exact measurements of affected acres not practicable.

Oak woodland

Figure 5. Canyon live oak and black oak mixed with scattered ponderosa pines along Shasta Lake.

Oak woodlands occur within the project area as both pure hardwood stands and as a component of the conifer forest. These areas contain a mix of canyon live oak and black oak, in combination with brush species including Brewer's oak and shrub tanoak.

Oak woodlands provide habitat for a wide variety of species and are an important component within coniferous forests as they can provide food for prey species and nesting/roosting, denning, resting, and cover opportunities for multiple species including bats and fisher.

Table 11: Acres of oak woodland in the project area[35]

[35] Acres derived from project Green-Horse Vegetation Report

Hardwood Forest/Woodland (acres)			
Canyon Live Oak	4,328		10%
Black Oak	8,117		19%
Total Hardwood Forest/Woodland	**12,445**	**~30%**	

Figure 6: Bald eagle nest along the Pit Arm of Shasta Lake.

Mature ponderosa pine

Large overstory ponderosa pines on slopes adjacent to or with lines of sight to Shasta Lake provide excellent nesting habitat for bald eagles. Multiple eagle nests and associated territories are located along a relatively narrow strip of trees between the ridgelines and the shorelines of the lake.

Eagle territories generally contain prominent large snags (pilot trees) located in close proximity to the water and the nest tree that are used as perches during foraging and for vigilance behavior when tending an active nest. Nest trees (and pilot trees) can be located in late-seral stands of mixed conifer or in younger mid-seral stands that contain only a few residual large overstory trees or snags.

Table 8 above shows 140 acres of late successional ponderosa pine in the project area. This figure is likely an underestimation of available bald eagle habitat due to the presence of individual large trees within an otherwise early or mid seral stand. This habitat would not be captured in EVEG as *late successional* habitat (i.e. bald eagle nesting habitat), because EVEG provides *average* tree size. Stands with scattered large pines may not show as mature or late successional pine habitat, but

would instead show as early or mid-successional stands, and would therefore not be included in the total acres of suitable bald eagle habitat.

Proposed hand treatment of eagle territories will treat 83 acres of known eagle territories (29 acres within LSRs and 54 acres outside of LSRs).

VII. Direct and Indirect Effects of the Action Alternatives (Alternative 2 and 3) - Habitat and Species Accounts

The effects of an action are those direct and indirect effects of an action on the species or its habitat, together with the effects of other activities that are interrelated or interdependent with that action. Directs effects are those that result in direct mortality, harm, failed breeding attempts or displacement of individuals. Indirect effects include those effects that are caused by or will result from the proposed actions and are later in time, but are still reasonably certain to occur.

Assumptions regarding the presence or absence of a species are made based on the suitability, quality and availability of habitat in the area in conjunction with current and historical detection information from surveys and incidental sightings. Assumptions regarding the effects to these species are made based on: the life history of the species; their relative levels of tolerance of fire in the ecosystem; their tolerance of human disturbance; and their vulnerability in the event of a widespread, unplanned ignition that results in large, high intensity wildfire.

Bald Eagle

The bald eagle was listed in 1967 under legislation that preceded the Endangered Species Act, and was officially listed as endangered when the Act was signed into law in 1973. It was listed as endangered in the lower 48 United States because of a severe decline in numbers. This decline was primarily attributed to the use of certain pesticides that caused reproductive dysfunction and eggshell thinning. Habitat loss and disturbance at nest and roost sites were also major factors. Eagle populations have rebounded since the banning of DDT and the increased protection for nesting and winter roosting habitat. The bald eagle was removed from the Endangered Species List by the USFWS on July 9, 2007 and is now managed as a Forest Service sensitive species. Viability of this species on the Forest is expected to be provided through implementation of the National Bald Eagle Management Guidelines (USDI 2007), the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and implementation of LRMP standards and guidelines for bald eagles.

Nesting territories are generally associated with lakes, reservoirs, rivers, or large streams. Nest trees are generally large-limbed, mature overstory conifers (generally pine) located within close proximity (2 miles or less) to large bodies of water that provide fish and water fowl for foraging.

Bald eagles have a very high fidelity to their established nests. A pair will remain in the same nest area year after year if left undisturbed. Around Shasta Lake, the nests are generally found in larger trees at a distance of 10 to 300 yards from the water's edge. Nests of adjacent territories are found at approximately 2 to 5-mile intervals, except for the Pit Arm of the lake where territories appear to be closer but are separated topographically from each other. This higher density of nests is believed to be the result of higher quality habitat in the Pit Arm of Shasta Lake. Most of the Pit Arm was not logged before construction of the dam and supports numerous snags, which provide foraging perches

and better fish habitat than is found in the other arms of the lake36; thus making the Green-Horse project area some of the most productive eagle nesting habitat around Shasta Lake.

Surveys for eagles and eagle nests are conducted along the entire shoreline of Shasta Lake on an annual basis by Shasta Lake district biologists. In addition, annual helicopter surveys are conducted by PG&E biologists along the entire length of the Pit River, for Federal Energy Regulatory Commission licensing compliance.

Bald eagles are present in the project area year-round, with both resident pairs and winter migrants. The number of known bald eagle nests on Shasta Lake has increased dramatically since record keeping began: from one known territory in 1970, 12 territories in 1980, 23 territories in 2009, and currently 35 territories in 2012, though not all are actively nesting on any given year.

The risk of habitat loss from high intensity wildfire is increased in the Shasta Lake area, and specifically the project area, particularly during periods of high recreational use, such as spring break, Memorial Day, Fourth of July and Labor Day vacations. During these periods, the increased risk of human caused fire, combined with high human use of areas in close proximity to eagle nest trees (i.e. lake shoreline), puts the important eagle nesting habitat elements at very high risk of loss from high intensity wildfire. This risk is increased further where large accumulations of fuel are present in close proximity to current and potential future nest trees (see Photo 5 above).

Direct and Indirect Effects from Alternative 2

No direct effects are expected from the proposed activities because design criteria for this project avoid disturbances during critical periods of bald eagle breeding season and when young are not mobile enough to readily move from a disturbance. In addition, because adult and fully fledged bald eagles are highly mobile, it is expected that when foraging or dispersing across the landscape *during the non-reproductive season* they can easily avoid smoke and activities that cause noise above ambient levels.

A Limited Operating Period (LOP) from January 1 to July 31 is in place on all smoke-generating activities and all activities that would generate noise above ambient levels, within 0.25 mile of known nest sites[37]. This LOP is in place because juveniles that are not yet able to fly and adults that are closely defending a nest are vulnerable to human disturbance. Young in the nest are vulnerable to disturbance from the below their nest as they can be flushed from the nest prematurely and attempt to fly before they are capable, causing mortality. Adult attendance to the nest and nestlings can be compromised when adults are unable to forage effectively within close proximity to the their nest or pilot trees due to highly smoky conditions; or due to a continual perceived need to defend against threats from below their nest and foraging behavior and nestling attendance are subsequently diminished.

As of the end of 2012 nesting season, there were eight eagle territories active within the Green-Horse analysis area (see table 12 below)[38]. Each of these territories will be evaluated for nesting status prior to project implementation and an LOP will be assigned to those territories determined to

[36] USDA Forest Service 1998

[37] This LOP may be lifted after consultation with the district wildlife biologist based on site-specific assessment of individual bald eagle nest sites.

[38] Includes a 0.25 mile buffer surrounding the project area. Information on eagle nests was derived from the Shasta Lake district records from the 2012 eagle surveys. This is considered to be the most accurate bald eagle information for Shasta Lake due to their intensive survey efforts; therefore, CNDDB was not consulted as it would not have contained the most current records or accurate placement of nests.

be actively nesting. Additional nests may be discovered during subsequent surveys and these would also be considered for LOPs.

Table 12: List of bald eagle territories active within the Green-Horse analysis area.

Bald Eagle Territories
McCloud Mouth
Reno Canyon
Susanville
Blue Canyon
Flume Canyon
Fort Creek Inlet
Frenchman Gulch
Greens Creek

Impacts to habitat from wildfire can be highly variable and are dependent on multiple factors such as time of year, moisture level of the understory fuels, slope, aspect, wind, position on the slope, as well as other factors. Impacts to habitat may be seen most noticeably in how the forest canopy responds to fire. Concerns over impacts to habitat from fire generally center on whether the canopy survives relatively intact, though other concerns can also include the availability of large woody debris and snags and the amount of duff consumed by the fire[39].

As described within the Fuels Report for this project, risks to the habitat from the proposed ignition are much lower than if ignition were to occur under unfavorable weather or fuels conditions[40]. Fuel and fire modeling done for the project area show the projected fire behavior during implementation within the treatment units and identified areas at a higher risk of crown fire (i.e. loss of overstory) and areas where the fire is more likely to burn with low intensity as a ground fire. No areas containing eagle nest zones were identified as at risk of active crown (i.e. a loss of overstory canopy) fire during implementation of the *prescribed fire*. However, fuels build up within the bald eagle nests zones is high, with a subsequently high risk of wildfire (see photo 5 above). It is for this reason that fuels reduction treatments are proposed in the more susceptible nest stands. As described above, direct impacts to bald eagles from these treatments are not expected due to the implementation of limited operating periods that would avoid nesting activities. Effects from treating the brush and fuels within these nest stands would be beneficial as the resulting stand would have a reduced risk of overstory loss (i.e. nest trees) from a high intensity wildfire.

The large conifers used by eagles for nesting at Shasta Lake are a limited and finite resource that if removed (through a stand replacing event) would have highly negative impacts on the nesting eagles. Fuels treatments around the nest stands with dense fuels accumulations would reduce this risk and help to ensure this important habitat element remains available for eagles at Shasta Lake.

[39] Smith et al 2000; Webster et al 2010.
[40] USDA 2011

Direct and Indirect Effects from Alternative 3

No direct effects to eagles are expected from this alternative for the same reasons as described above for Alternative 2. However, negative indirect effects would result from not treating the fuels build up within eagle nest stands, as the eagle habitat would not benefit from the reduced risk of loss resulting from these treatments. Eagle nest stands in the project area are at high risk from overstory loss as they are highly exposed to human caused wildfire due to their close proximity to the edge of this popular, recreational lake – particularly during the hottest, driest periods when lake use is at its highest and fuel conditions are at their most volatile. As described above, the large overstory conifers juxtaposed along the shorelines are a limited and finite resource that cannot be replaced in a practical timeframe and their loss would cause serious negative impacts to the eagles that rely on them as nesting structures.

Therefore, Alternative 3 is the least beneficial of the two action alternatives to the eagle population at Shasta Lake.

Shasta Salamander

The Shasta salamander has a very narrow range of distribution and is locally endemic to the Shasta County area and found primarily in areas near Shasta Lake though detections have been made recently in areas to the south and west of Shasta Lake.[41] Most of its range is within the Shasta-Trinity-Whiskeytown National Recreation Area. The Shasta salamander has a discontinuous distribution within its range. It occurs in elevations ranging from approximately 730 to 3,475 feet; which reflects recent surveys done in 2012 that extended the known range of the Shasta salamander approximately 7.6 miles to the south and 10.7 miles to the west of its previously known range. [42] [43] [44] California Dept. of Fish and Game list approximately 213 known locations primarily around Lake Shasta[45]. STNF records show 47 occurrences within the Green-Horse project area, though these are not necessarily different individuals, and are likely recurring detections of many of the same individuals on different years, as this area has had multiple surveys over the last 10 years.

The Shasta salamander exhibits an entirely terrestrial life cycle, is sensitive to temperature and moisture, and occurs in cool, moist micro-habitats[46]. It primarily inhabits limestone formations in the Shasta Lake area and the slopes adjacent to these areas. A recent survey found that it may also inhabit non-limestone habitats near the McCloud Reservoir, though these occurrences are not common and are considered more of an anomaly. Microhabitats favored by this species include moist limestone fissures, caves, and rock outcroppings; in addition to underneath rocks, woody debris and duff in mixed pine-hardwood stands adjacent to moist caves, rock crevices and outcrops, and cliff faces.

A survey protocol and management plan has been developed for this species on the Shasta-Trinity National Forest. It is regularly surveyed for as part of the assessment process prior to ground disturbing activities. Primary threats listed in California Dept. of Fish and Game Non-game species assessments include increased recreation around Shasta Lake, limestone quarrying, and raising of lake water levels. In addition, timber harvest can cause a loss of habitat and possible direct mortality,

[41] Naumann and Olsen 2004; Lindstrand et al 2012
[42] CDFG 2012
[43] Lindstrand et al 2012
[44] Lindstrand et al 2012
[45] Calif. Dept. of Fish and Game; website accessed 2012.
[46] Olsen and Lewendal 1999

due to moisture loss via canopy reduction and ground disturbance. Highways can act as barriers to dispersal, and rock quarries can remove or disrupt habitat.

Direct and Indirect Effects from Alternative 2

Direct impacts to Shasta salamanders and impacts to habitat elements that may be used by the salamanders (such as downed logs, loose large rocks, etc.) are avoided through implementation of Forest Plan Standards and Guides and the Project Design Features described below:

- No noise-generating or habitat modification activities would take place within **250 feet of caves.**
- No mechanized equipment or pile construction would occur within **300 feet of limestone** rock outcroppings.
- All ground disturbing activities within 300 feet of a limestone outcropping would occur only during periods of time when the salamanders are **not surface active**, as determined by the district wildlife biologist using descriptions within Shasta salamander survey protocols.
- **Only hand line construction** would be allowed within 300 feet of limestone outcroppings.

These design features are in place because, as described above, Shasta salamanders are found under restrictive microclimate conditions and are closely tied to limestone outcroppings and the ground cover types associated with this habitat, i.e. rocks and woody debris. Tag and recapture studies have shown that Shasta salamanders do not travel far from these habitat elements, with an average travel distance between capture points of 45 feet, though many do not travel farther than 3 feet, with a maximum distance of 300 feet over a one year time period[47]. Therefore, implementation of Project Design Features specific to Shasta salamanders, requiring a 300 foot buffer from limestone habitats for all activities that may directly or indirectly affect Shasta salamanders or their important habitat elements, will avoid impacts to this species during project implementation.

In addition, Shasta salamanders within rock outcrops or limestone caves are typically active at the surface during periods of high moisture and will withdraw into subsurface refuges (i.e. crevices, beneath rocks or logs) when surface moisture abates[48]. These times of surface activity, are described within the Shasta salamander survey protocol[49] as during wet weather systems with optimal temperatures from 38 to 41 degrees Fahrenheit and humidity within caves or outcrops of at least 90% and in adjacent habitats of at least 65%. Burn prescriptions designed for the project *would not* include these weather and surface conditions. Periods where Shasta salamanders are *not* surface active are described within the survey protocol as ideal time periods for management activities because actions during times, when the salamanders are *not* exposed to the surface, would avoid direct impacts to salamanders.

Dozer line and fuel reduction activities would not take place within limestone habitat or near cave entrances. Where fire line is necessitated in limestone areas, hand line will be constructed under the direction described in the Project Design Features above. Areas of fuels treatments do not occur in limestone habitat. Therefore, impacts from these activities are not anticipated.

In addition, the Forest Plan also directs protection of potential sites/caves that may be used by Shasta salamanders. Forest-wide Standard and Guides for the protection of caves and cave-like structures state that forests must "manage these unique habitats on a site-by-site basis to protect their existing

[47] 2002 PSW http://www.fs.fed.us/psw/topics/wildlife/herp/shasta_sal.shtml
[48] Lewendal 1995; Thelander and Crabtree 1994
[49] Olson and Lewendal 1999

micro environments and the viability of dependent animal and plant species. Manage nearby water sources to perpetuate natural cave processes".[50]

Direct and Indirect Effects from Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. All Project Design Features described for Alternative 2 would be applied in Alternative 3, though there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used; however, dozer line construction in Alternative 2 would not occur within areas of limestone, therefore impacts from dozer line construction were not anticipated.

With a reduction in overall treatment, it would follow that a reduction in potential impacts would occur. However, meaningful or measurable impacts were not anticipated for this species from the Alternative 2, so it would also follow that impacts from treating a reduced number of acres with Alternative 3 would be the same.

Pacific fisher

Populations of fisher (*Martes pennanti*) currently occur in the North Coast Ranges of California and the Klamath-Siskiyou Mountains of northern California and southern Oregon. Additionally, surveys and sightings in California place fisher throughout much of the Sierra Nevada range. The Klamath region population, which includes the project area, may be the largest remaining in the western United States.[51]

The West Coast Distinct Population Segment (DPS; in California, Oregon, and Washington) of the Pacific fisher was designated as Candidate in 2004 by the USFWS. USFWS concluded that loss of the species from the west coast range would represent (1) a significant gap in the species range, (2) the loss of genetic differences from fisher in the central and eastern United States, and (3) the loss of the species from a unique ecological setting. Therefore, it qualified as an entity considered for listing.

According to the USFWS Notice of Candidate Review[52], major threats to fisher are actions that fragment or remove key elements of fisher habitat. Major threats to fisher that were noted to lead to direct mortality and injury included vehicle collisions, predation, and disease. The USFWS considered the magnitude of threats as high, resulting in a negative impact on fisher distribution and abundance. However, they considered threats to be non-imminent with greatest long-term risks to be the isolation of few, small populations. West Coast DPS listing is warranted but precluded with a number six listing priority.

The fisher is a forest carnivore that occupies late seral stage habitat in mature and old growth mixed conifer stands most often between 2,000 - 5,000 feet elevation, with a home range that can be very large (up to 11,000 acres in low quality habitat).[53] Fisher are generalized predators, and prey on small to medium sized mammals and birds. They will also eat carrion and fruits. In the western mountains, fishers prefer late successional forests (especially for resting and denning) and occur

[50] LRMP p.4-14
[51] Carroll C.R et al 1999.
[52] USDI 2006
[53] CDFG 1993.

most frequently where these forests have the fewest non-forested openings[54]. Historically, trapping for fur reduced populations.

Drainage bottoms may be used more often for resting compared to ridge-tops and mid-slope locations possibly due to increased access to water, increased prey abundance, larger trees, and denser canopy cover[55]. Riparian areas provide concentrations of rest site elements, such as broken-top trees, snags, and coarse woody debris. Whether for prey availability, water access, riparian vegetation or microhabitat conditions, Self (2001)[56] found fisher selectively used rest sites within 500' of water, and rarely farther than 1,100' from water.

Fishers tend to use large live trees with cavities, particularly oak species more often than logs for rest structures.[57] Self (2001) also found that large (≥ 40"dbh), green trees (most frequently Douglas fir with mistletoe brooms and/or forks) were used for rest sites 79% of the time, while conifer snag cavities were used 15%, and logs used 6%. Other studies have found that fisher will use cavities within hardwoods as preferred structure for denning.[58]

The Shasta-Trinity LRMP Habitat Capability Models describe habitat guidelines for fisher as: late seral, older stands with snag density as 4-7 snags per acre >36"dbh and 2-4 of 24-36"dbh (high capability) or 2-4 snags/acre (moderate capability). Optimal cover for coarse woody debris is over 6 logs per acre or 2-6 logs per acre (moderate capability) (>10 feet long at highest available diameter).[59]

Fishers are likely present in the project area because they are known to be present along the perimeter of the project area, and are therefore likely to occur within the bounding of the project area. Habitat suitability for fisher within the project area is variable depending on multiple habitat elements including canopy closure, stand composition, proximity to water, elevation, and abundance of large snags and downed logs.

Within CNDDB, there are two fisher sightings in the project area, both in 2004. The area surrounding Green Mountain was surveyed for forest carnivores in the late 1990's, though no fishers were detected. The area of inundation (if Shasta Dam is raised) was also surveyed in 2007 and fishers were detected in multiple areas, though none directly within the project area. CNDDB has at least 13 fisher detections throughout the Shasta Lake area, particularly to the west of the project area within the Sacramento River Arm of Shasta Lake.

The majority of the fisher sightings in the Shasta Lake area have been near the shoreline of the lake. It is unknown if this is a function of observational bias and/or survey methodology (i.e. they are where you look for them) or if there is a particular habitat component in these locations to attract fishers to these areas (i.e. water, prey) as the habitat around the lake is not typical fisher habitat that is found where other fisher sightings and known dens occur. Nevertheless, there have been multiple fisher detections surrounding Shasta Lake, and throughout the Shasta Lake district and NRA.

Direct and Indirect Effects from Alternative 2

While suitable habitat exists in the analysis area for fisher, the quality of this habitat is variable. Portions of the analysis area contain mid and late seral, mixed conifer forest that includes high amounts of large woody debris and snags as preferred by this species, in addition to a general lack of

[54] Powell R.A, Zielinski WJ. 1994.
[55] Yeager, S.J. 2005.
[56] Self SE, Kerns SJ. 2001.
[57] Zielinski, W.J. et al 2004.
[58] Seglund A.E. 1995
[59] STNF LRMP Appendix G; p-G-5

fragmentation from roads, timber harvest, agriculture or urbanization within a majority of the project area.

The method used for identifying suitable fisher habitat within the project area is described above in the Methodology section; acres are listed in Table 13 below. It is acknowledged that these figures are estimates and that actual habitat use of the project area by fishers is unknown.

Table 13: Late and mid successional conifer and black oak fisher habitat

Fisher Habitat	Project Area
Late-successional	3,850
Mid-successional	26,480

Direct effects can include physical harm, death or the disruption of reproductive attempts that could occur during project implementation or near occupied habitat. The majority of impacts from proposed activities would be along ridgetops where fire line would be constructed and prescribed fire would be ignited and allowed to back down the slope in a mosaic pattern. However, fishers tend to avoid ridgetops and generally use the lower slopes and riparian corridors where no fire lines would be located and prescribed fire would burn at its lowest intensity, if at all[60]. It is therefore unlikely that this species would occur in areas where they would be unable to avoid impacts. In addition, adults of this species are highly mobile and capable of moving away from sources of disturbance[61]. Therefore, they are unlikely to be directly impacted during the non-reproductive season during project implementation.

Parturition for fisher occurs between February and mid-April, and young are completely mobile and capable of normal locomotion by 10-12 weeks old, which would mean that any young that may occur in the project area would be old enough by July 10 (end of the limited operation period (LOP) for NSO habitat) to move away from a source of disturbance i.e. humans or fire[62]. Because there is overlap between suitable northern spotted owl (NSO) nesting/roosting habitat and suitable denning habitat for fisher (as described above), it is likely that the LOP for NSO, i.e. February 1 to July 10, would help to avoid direct impacts to fisher during periods of reduced mobility. Areas included in the LOP, i.e. mid and late successional habitat in the northern end of the project area, would have the highest likelihood of fisher use during the reproductive season, as these areas contain the highest canopy closure, highest amounts of snags, large trees, and large downed logs with potential areas for denning. The NSO LOP will help to avoid direct impacts to fisher during the reproductive period that may occur as a result of the proposed activities; however, because there is also *potential* denning habitat that is not affected by the LOP (areas *not* suitable for NSO) it is possible that impacts to individual fishers during the reproductive period may still occur if burning operations are implemented during periods of reduced mobility (i.e. spring).

However, according to the USFWS[63], threats to fisher are from habitat loss and fragmentation due to timber harvest, roads, urban development, recreation, and wildfires. Other threats include small

[60] Zielinski et at 2004; USDI 2010a
[61] Kennedy and Fontaine 2009
[62] Ruggiero et al 1994.
[63] USDI 2010a

population sizes and isolation, predation, and human-caused mortality from vehicle collisions, poaching, and incidental capture and injury[64]. Prescribed fire, and the activities associated with it, are not described as a threat to fisher population viability and are not expected to have any deleterious impacts to the species. Fisher populations are susceptible to habitat loss and fragmentation in addition to genetic isolation.[65]

The proposed activities do not affect or promote any of the threats described by the USFWS, and instead would result in a beneficial impact from a reduction in the susceptibility of the suitable habitat in the project area to loss from intense wildfire. As demonstrated by the fire and fuels modeling described in Table 7, and the recent fire history of the area, there is a high likelihood that more high intensity, unplanned fire would occur within the project area[66]. The primary goals of the proposed project are to restore a natural fire cycle and stand resiliency, while protecting the habitat within and adjacent to the project area from high severity wildfire or stand replacing events. The increased risk of habitat loss from wildfire argues for accepting the reduced risks of a prescribed fire.

The proposed activities are also not likely to negatively impact currently intact suitable habitat due to the conservative treatment prescriptions that would be applied to the burn activities, i.e. low intensity burning, backing down slope to achieve a mosaic of burned and unburned vegetation with little to no active crown fire or subsequent loss of overstory structure[67]. Some elements of currently suitable habitat may be altered if understory components are removed by fire, which may result in some short term impacts to the forest structure. Understory vegetation would begin to recuperate the following season and likely return within approximately 10 years[68].

Loss of habitat due to high intensity fire would be avoided because of the method by which fire would be applied, i.e. ignited during cooler, wetter periods, on ridgetops and allowed to back down the slope in a mosaic burn pattern. This type of fire would not constitute habitat degradation, and would only slightly modify the suitability of the habitat for fisher in the short term while improving the long term suitability and resiliency.

In addition, Standards and Guidelines in the LRMP will be met within the project area post-treatment, including guidelines for Riparian Reserves and snag/downed log levels. It is therefore unlikely that habitat for this species would be negatively affected by treatments within these areas.

Direct and Indirect Effects from Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. In addition, there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used.

Indirect impacts resulting from a lack of treatment to suitable fisher habitat could result in the eventual loss of that habitat from high intensity wildfire. The exact amount of fisher habitat affected by this alternative is difficult to assess because we do not know the specific areas that may be used for activities such as denning or resting within the project area; particularly because of their uncharacteristic use of areas near Shasta Lake that would otherwise be considered as unsuitable for fisher.

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[64] USDI 2010a
[65] USDI 2010a
[66] Green-Horse Fire/Fuels/Vegetation/Air Quality Report
[67] Green-Horse project Fire/Fuels/Vegetation Report
[68] Sugihara et al 2006

The MLSA will be treated with both action alternatives, so the more mature forested habitat described above that may provide potential denning habitat during the reproductive season would be treated with both action alternatives. Therefore, the same potential for impacts during the reproductive season in these areas exists for both alternatives. However, other areas aside from the MLSA that would not be treated with Alternative 3 may *also* provide denning habitat yet go untreated with this alternative. So, it would follow that a reduction in overall treatment would result in a reduction in potential *direct* impacts.

However, in analyzing indirect effects of Alternative 3, we cannot establish all areas used by fishers that will go untreated with this alternative and subsequently provide an analysis of meaningful impacts to fisher from this *lack* of treatment. It can be assumed, based on the fire and fuels modeling described above, that areas of suitable fisher habitat not treated prior to a high intensity wildfire event would be at high risk of loss during that event.

Northern Goshawk

Northern goshawks can be found in middle and higher elevation mature coniferous forests; usually with little understory vegetation and flat or moderately sloping terrain. On the Shasta-Trinity NF, nesting habitat consists of relatively closed canopied, mid- and late-successional mixed conifer forest with scattered harvested and natural openings. Foraging habitat is variable and includes mid- and late-successional forest, natural and man-made openings, and forest edges[69]. Moderate and high quality habitats contain abundant large snags and large logs for prey habitat and plucking posts.[70] This habitat provides large trees for nesting, a closed canopy for protection and thermal cover, and open spaces allowing maneuverability below the canopy.[71] Goshawks are the largest North American accipiter and can consequently hunt a large variety of prey including woodpeckers, owls, tree squirrels, and grouse. In California, territories associated with large contiguous forest patches have been found to be more consistently occupied by nesting goshawks compared to highly fragmented stands[72]. Disturbance near nests can cause temporary displacement and/or nest abandonment.[73]

Goshawk habitat affiliations in northern California generally match those of the northern spotted owl (NSO)[74]. Therefore, as described above in the Methodology section, queries of the EVEG data for NSO habitat were used as a proxy for goshawk habitat. A small amount of marginal habitat, and even less high quality, late-successional habitat, occurs in the northern portion of the project area, near and within the Madrone MLSA. If goshawks were to occur in the project area it would be within drainages and north facing slopes where there is a more moderate degree of slope.

Goshawk Habitat*	Project Area - acres
Late-successional *(NSO nesting/roosting)*	301
Mid-successional *(NSO foraging)*	1,011

*Acres of NSO nesting/roosting and foraging habitat from the BA.

[69] Woodbridge and Detrich 1994
[70] Squires, and Reynolds 1997
[71] Ibid.
[72] Ibid.
[73] Squires and Reynolds 1997
[74] Zielinski et al 2004; Yeager 2005; Austen 1994; USDI 2010a

The Shasta-Trinity LRMP expects that habitat for goshawks will be provided through maintaining 100 to 200-acre territories for known goshawk nesting pairs, management of northern spotted owl habitat, riparian reserves, old growth reserves, dead/down and green tree retention with snag management.

Direct and Indirect Effects from Alternative 2

Direct effects include physical harm, death or the disruption of reproductive attempts that could occur during project implementation or near occupied habitat. The probability is low that individual goshawks may be injured or killed during project implementation for several reasons: goshawks are unlikely to occur in the areas that would be most affected by proposed activities, i.e. ridgelines and areas adjacent to ridges as this species nests on the lower slopes or bottoms of drainages and generally avoids ridges for foraging or nesting75; nests are highly unlikely to be located along ridges where disturbance from dozer line activity would occur, which would preclude disturbance to a nest on the off chance that one were to occur in the project area; if a goshawk were present during either dozer line reconstruction or prescribed burning activities, adults are highly mobile and perfectly capable of maneuvering away from a disturbance.

Dozer line activity will only occur along areas of pre-existing lines (i.e. very little overstory), so no so indirect effects to overstory or nesting habitat would not occur when lines are re-opened. Additionally, because of the method by which fire would be applied, i.e. with low intensity and allowed to back down from the ridges in a mosaic pattern of burned and unburned vegetation, negative impacts to goshawk habitat are not expected. Overstory trees are not expected to be impacted except for possibly in small (<5 acre) patches where fire may encounter higher levels of fuel and burn hotter[76]. As described above in the discussion for fisher and bald eagle, negative impacts to the overstory and other important habitat elements are not expected from the proposed activities due to the intent of the prescription to mimic a low to moderate intensity fire and the location of dozer line activities outside of suitable habitat.

Both prey accessibility and prey abundance for goshawks is important for overall fitness[77]. Reynolds et al. (2006)[78] emphasized the importance of developing and maintaining mosaics of vegetation patches in different successional states within goshawk home ranges in order to provide an abundant and diverse prey base as well as adequate nesting and foraging habitat for goshawks. Where habitat exists in the project area, it would be maintained with these parameters, as prescribed fire influences the understory vegetation composition in addition to the level of downed woody debris and snags. Indirect effects may be beneficial, as habitat for goshawk prey species would be developed and maintained through the application of low intensity, mosaic burning within the understory. The

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[75] Woodbridge and Detrich 1994; Squires and Reynolds 1997

[76] Note that although we know that these prescribed burns will burn in a mosaic, patchy manner, we cannot reasonably quantify the size or distribution of these patches nor the exact proportion of unburned area versus burned area. Fire behavior models can tell us reliably how fire will behave under specific conditions, but the conditions that control this behavior vary at a much smaller scale than our landscape level information can tell us. We determine the 'typical' or modal condition of the landscape through sampling and the characterization of GIS polygons identified in satellite or aerial remote sensing relative to this sampling. But many of the landscape characteristics that control site-specific fire behavior occur at smaller scales than our sampling and mapping can identify and these determine the 'micro-behavior' of the burns. It cannot reasonably be determined from the models where exactly the fire will skip, where exactly it will flare up to burn an individual tree or small patch, or where exactly it will behave as the landscape models predict. What we can reasonably determine is the overall, modal condition post-burn of specific fire parameters such as canopy bulk density or available fuel. Please see the combined Fire/Fuels, Air Quality and Vegetation Specialist Report for this project for a discussion of some of the complexities of fire modeling.

[77] Reynolds et al 2006

[78] Reynolds et al 2006

proposed actions would not remove existing goshawk habitat and would likely benefit the condition of the small amount of current habitat into the future.

Direct and Indirect Effects from Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. In addition, there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used.

The MLSA will be treated with both alternatives, and so the more mature forested habitat described above that would provide the only potential goshawk nesting habitat would be treated with both action alternatives. Therefore, indirect effects to goshawk habitat would be the same for Alternative 3 as described for Alternative 2 above.

No direct impacts during the reproductive period are expected from Alternative 3 due to lack of nesting habitat in areas where fire line construction would occur, and due to the LOP on suitable NSO nesting/roosting habitat that would also serve to protect any unknown nesting goshawks in the area. Consequently, no meaningful or measurable impacts are anticipated for goshawks from Alternative 3.

Bats

Summary

The Forest Plan has Standards and Guidelines (4-63, 4-70) which direct protection of potential sites/caves that may be used by bats (caves, mines and abandoned wooden bridges, and buildings) with a protection buffer for all disturbance or habitat modification within 250 feet of known cave roosts. In addition, forest-wide Standards and Guides for the protection of caves and cave-like structures state that forests must "manage these unique habitats on a site-by-site basis to protect their existing micro environments and the viability of dependent animal and plant species. ...Manage nearby water sources to perpetuate natural cave processes".[79] In addition, Project Design Features specific to bat species include:

- No noise-generating or habitat modification activities would take place within **250 feet of caves, mine shafts or mine adits.**
- No mechanized equipment or pile construction would occur within **300 feet of limestone** rock outcroppings.
- **Only hand line construction** would be allowed within 300 feet of limestone outcroppings.

Whether or not the project area is used by pallid, Townsend's big-eared or western red bats is unknown. Pallid bats have been detected during surveys conducted north of the project area in the Squaw Creek and Sacramento River watersheds and monitored at a significant bridge roost on the Sacramento River80. Townsend's big-eared bats have been documented in the nearby Sacramento watershed and a roost is known to exist in a cave to the northeast of the Pit Arm watershed on the McCloud Ranger District. CNDDB records indicate two Townsend's big-eared bat sightings within

[79] LRMP p.4-14
[80] Pierson and Rainey 2007

the project area within the watershed of the Pit Arm of Shasta Lake. No western red bats have been detected within or near the project area.

No bat surveys have been conducted within the project area. However, surveys for bats are not always useful for detecting roosts because if bats are caught using mist nests or detected using echolocation detectors, they are out of the roost and foraging so only presence/absence data is actually acquired. In addition, roost site selection can vary from day to day and week to week when the bats are not hibernating. Protection of caves, bridges, mines, and other more permanent structures may provide the most long term benefit to bats that use cavities and crevices for roosting and hibernacula. Though they are widespread, trees are inherently transient as roost structures for cave and crevice dwelling bat species.

Pallid bats

Pallid bats are usually found in low to middle elevation habitats below 6,000 feet. A variety of habitats are used by this species, including grasslands, shrublands, oak woodlands, and coniferous forests, where it forages on a wide variety of insects and spiders. Pallid bats most often occur in open, dry habitats that contain rocky areas for roosting. They are a yearlong resident in most of their range and hibernate in winter near their summer roost. Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves, and a variety of human-made structures. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and giant sequoias, and bole cavities in oaks[81]. Cavities in broken branches of black oak are very important and there is a strong association with black oak for roosting. Roosts have warm, stable temperatures and are generally high above the ground. Roost sites must protect bats from high temperatures, as the species is intolerant of roosts in excess of 104 degrees Fahrenheit[82]. Night roosts are usually more open sites and may include open buildings, porches, mines, caves, and under bridges. These are usually located within or near (< 1.5 km) foraging areas and within 2 km of water[83]. Although year-to-year and night-to-night roost reuse is common, they may switch day roosts on a daily and seasonal basis[84].

Winter habits are poorly known, but this species apparently does not migrate long distances between summer and winter sites. Sherwin (2005) found that in coastal California, males and females overwinter in a primary roost but occasionally use alternate roosts throughout the winter. Overwintering roosts have relatively cool, stable temperatures and are located in protected structures beneath the forest canopy, out of direct sunlight. In other parts of the species' range, males and females have been found hibernating alone or in small groups, wedged deeply into narrow fissures in mines, caves, and buildings.

Pallid bats are sensitive to disturbance and if they are persistently or severely disturbed, they will vacate roosts[85]. Disturbances at bat roosts can have severe bioenergetic consequences for bats, particularly when disturbances occur at hibernacula[86].

This bat species' tendency to roost in groups and their sensitivity to disturbance make them vulnerable to mass displacement. Roosts and hibernacula can be damaged or destroyed by vandalism, mine closures and reclamation, recreational rock climbing, and timber harvest[87].

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[81] Pierson and Rainey 2007
[82] Pierson and Rainey 2007
[83] PBRT 2008
[84] Sherwin 2005
[85] PBRT 2008; Sherwin 2005
[86] PBRT 2008; Sherwin 2005
[87] Sherwin 2005

Maternity colonies and hibernating bats are especially susceptible to disturbance. Loss or modification of foraging habitat due to fire, urban development, agricultural expansion, and/or pesticide use poses potential threats[88]. Populations have declined in California within desert areas, in areas of urban expansion, and where oak woodlands have been lost.[89]

Direct and Indirect Effects from Alternative 2

Direct mortality could result from the loss of snags actively being used as roosts if they were to catch fire and fall during prescribed burning operations. If snags suitable for roosting fall, even if unoccupied, potential day roost habitat would then be lost.

Parturition for pallid bats generally occurs in early July. However, pallid bats tend to use more permanent structures for roosting during reproductive periods, such as caves, rock crevices, bridges, and human made structures, and tend to only use trees as day roosts or feeding perches90. Maternity roosts (when females and young are roosting together in larger groupings and are vulnerable to disturbance) are not likely to be impacted by proposed activities in part because prescribed burning would not be implemented during the summer months, as the hot, dry conditions would be out of the burn prescription. In addition, caves and rock crevices used as roosts throughout the year would not be meaningfully impacted by the proposed activities, due to both the 250' protection buffer and because fire generally doesn't affect rocks and rocky outcroppings.

Direct or indirect impacts to pallid bats may occur from proposed activities through disturbance to individuals roosting outside of caves or rock crevices, and potential loss of some roosting structures (i.e. snags or large trees). However, while incidental loss of snags or trees may occur (i.e. potential day roosts) if they were to catch fire during burning operations, the burn prescription is not designed to remove overstory trees or snags, so loss of these structures would occur only as an occasional anomaly.

Caves and limestone outcroppings will have a protection buffer, so any roosting bats within these areas would not be affected. Dozer lines will be re-opened along lines that have already been created in the past, and as such will be unlikely to contain suitable bat roosting habitat such as large snags.

Disturbance in general from human activity in the area during prescribed burning activities has the potential to disrupt bat behavior if individuals were present in the area at the time, but they are highly mobile when not hibernating and can move away from a disturbance, especially of the type that is non-recurring and transient, as would be expected from the proposed activities.

So, while it is possible that impacts to individual pallid bats may occur if they are present in the area during implementation, it is unlikely that measurable and meaningful impacts to the species as a whole would occur.

Direct and Indirect Effects from Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. In addition, there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used.

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[88] Sherwin 2005
[89] Pierson and Rainey 2007
[90] PBRT 2008

No impacts are expected from Alternative 3, as this alternative treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. Therefore, while there is potential for an individual pallid bat to be directly or indirectly impacted from the proposed activities, measurable or meaningful impacts are not expected.

Since no meaningful or measurable impacts are expected from Alternative 2, and no additional areas are treated with Alternative 3, no measurable or meaningful impacts are expected from Alternative 3 either.

Townsend's big-eared bat

Townsend's big-eared bats (TBEB) are distributed broadly throughout western North America. They occur in two disjunct, isolated populations in the central and eastern United States. In the West, this species' range extends from the Pacific coast north to southern British Columbia, south to central and southern Mexico and the Baja Peninsula[91]. This species is found throughout California from low desert to mid-elevation montane habitats and has a particularly affinity for cavernous spaces such as mines, adits, caves, old buildings and bridges[92]. A study conducted in the early 1990's investigating the status of TBEB found marked population declines in California over the past 40 years: a 52% loss in the number of maternity colonies, a 44% decline in the number of available roosts, a 55% decline in the total number of animals (primarily adult females), and a 32% decrease in the average size of remaining colonies[93]. Data gathered with this study and others indicated that the species was "roost limited" and the primary cause for the declines was human disturbance of roosting sites[94]. Subsequent to multiple studies on the threats to this species, it was added to the Regional Forester's Sensitive Species List and protective measures at roost sites were initiated.

Townsend's big-eared bat is a colonial species, with females aggregating in the spring at nursery sites, giving birth to one young in late spring or early summer. These nursery colonies, comprised of adult females and their young, remain intact until the young are independent in late summer or early fall. If undisturbed, colonies will use the same roosts indefinitely. Summer aggregations in California are presumed to be nursery colonies comprised only of adult females and their young. During the summer months, adult males are generally found roosting alone[95].

Unlike many species which take refuge in crevices, TBEB only roosts in the open, hanging from walls and ceilings fairly close to the ground, where it is relatively easily detected, which contributes significantly to its vulnerability to human disturbance[96].

This species requires a relatively large, but enclosed space with a fairly substantial opening and area inside large enough to allow extended flight within the roost, but also somewhat enclosed and dark to semi-dark. They are also quite sedentary, with females not known to move more than a few kilometers from their natal roost and movement in the nursery season, either for foraging or shifting to an alternate roost, is confined to within 15 km of the primary roost[97]. Seasonal movements are also limited, with fall movement to hibernacula no more than 43 km for summer roost sites[98] .

[91] Pierson and Rainey 2007
[92] Rainey and Pierson 1997
[93] Pierson and Rainey 1997; Pierson and Rainey 1997
[94] Gruver 2006; Pierson and Rainey 2007
[95] Pierson and Rainey 2007; Gruver 2006
[96] Pierson and Rainey 1997
[97] Sherwin et al 2000
[98] Sherwin et al 2000

Although historic and current records for this bat in California indicate the species occurs in a wide variety of habitats and in several life zones, its distribution appears to be constrained primarily by two factors: availability of suitable roosting sites and degree of human disturbance at roosts99.

There are a number of significant maternity and hibernating sites in both lava tubes and limestone caves in the northern California, particularly in Shasta, Siskiyou and Trinity counties. The Townsend's big-eared bat has been documented in the nearby Sacramento watershed and a roost is known to exist in a cave to the northeast of the Pit Arm watershed on the McCloud Ranger District. CNDDB records indicate two sightings of this species within the project area within the watershed of the Pit Arm of Shasta Lake, near Susanville Canyon. Habitat in the form of limestone caves is available within the project area and it is possible that TBEB occupy the area.

Direct and Indirect Effects from Alternative 2

As described above, primary threats to Townsend's big-eared bats are a general lack of roosts and human disturbance to their roost sites, particularly during the reproductive or nursery period from spring to early summer[100]. Project design features intended specifically for bat species will alleviate impacts to this species from the proposed activities. No noise-generating or habitat modification activities will take place within 250 feet of caves, mine shafts and mine adits to protect known or potential Townsend's big-eared bat, and other bat species, roost sites. This design feature will not only protect this species from direct impacts in the form of human disturbance, but it will also ensure that the microclimate within the cave remains intact by retaining the vegetation at or near the opening of the potential roost site. So, none of the important habitat features specific to TBEB would be affected by implementation of the proposed activities. Therefore, while there is potential for an individual TBEB to be directly or indirectly impacted from the proposed activities, measurable or meaningful impacts are not expected.

Direct and Indirect Effects from Alternative 3

Impacts to TBEB from Alternative 3 are not discernable from those of the Alternative 2 because the same Project Design Features would be implemented regardless of the alternative chosen. In addition, Alternative 3 treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. Therefore, while there is potential for an individual Townsend's big-eared bat to be directly or indirectly impacted from the proposed activities, measurable or meaningful impacts are not expected.

Western red bat

Western red bats are locally common in some areas of California; occurring from Shasta County to the Mexican border, west of the Sierra Nevada/Cascade crest and deserts, though research suggests that the most significant distribution exists in the Central Valley and to a lesser degree the Salinas Valley101. Red bat winter range includes western lowlands and coastal regions south of San Francisco Bay. In general, red bats are associated with lower elevations and are usually not found greater than 1,000' elevation, though occasional single males have been located in higher elevation stands. Breeding females are confined to areas less than 600' elevation and that rarely see below freezing temperatures, in part due to their habit of roosting in foliage where frost would be an impediment to thermoregulation102.

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[99] Gruver 2006; Sherwin et al 2000
[100] Pierson and Rainey 1997; Pierson and Rainey 2007; Gruver 2006; Sherwin et al 2000
[101] Zeiner et al. 1990; Pierson et al 2006; Bolster 2005
[102] Pierson et al 2006

Red bats are typically solitary and require water and have a strong association with mature riparian forest, particularly cottonwoods, sycamores and oaks103. Red bats are one of only two species of bat in California that roost in the foliage of the upper canopies of mature riparian forests, generally in the largest trees available, and are dependent upon relatively extensive stands of this riparian forest104.

During the course of a six year survey period (June through September 2005-2010) with over 80 nights of bat mist net monitoring at the Trout Creek watershed area (north of the project area), only two red bats were found. Both bats were captured in late August during migration. No western red bats have been detected within the project area, though no formal surveys have been conducted. Habitat for red bats in the project area is extremely limited and would not be extensive enough to support large numbers of red bats.

Direct and Indirect Effects from Alternative 2

If red bats are present in the project area, it would be in very limited numbers, and would likely be solitary or migrating males due to their apparent higher tolerance for non-typical habitats and slightly higher elevations[105]. The majority of the areas to be treated are upslope from the riparian areas, though fire would be allowed to back down, with low intensity, to drainages. However, there is very little, mature riparian forest within the affected drainages, and no known areas of mature cottonwoods or sycamores.

Impacts to red bats from the proposed activities are not expected, due to the low likelihood of occurrence and the lack of expected impacts to the habitat they utilize. In addition, this is a highly mobile species and if present, would be able to retreat to areas less affected by disturbance. Furthermore, no suitable habitat would be removed or altered.

Direct and Indirect Effects from Alternative 3

No impacts are expected from Alternative 3, as this alternative treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. Therefore, while there is potential for an individual western red bat to be directly or indirectly impacted from the proposed activities, measurable or meaningful impacts are not expected.

Since impacts are not expected from Alternative 2, and no additional areas are treated with Alternative 3, no measurable or meaningful impacts are expected from Alternative 3 either.

Terrestrial Mollusks

Shasta chaparral, Shasta sideband, Wintu sideband, Shasta hesperian

The Shasta chaparral, Shasta sideband, and Wintu sideband are all associated with limestone and/or talus rock outcroppings near Shasta Lake.

The Shasta sideband and Wintu sideband are both strongly associated with the Pit Arm of Shasta Lake. Habitat for both species includes limestone areas, including caves, talus slopes, and other rocky areas adjacent to open, brushy areas, or pine-oak woodlands.

[103] Pierson et al 2006
[104] Pierson et al 2004
[105] Pierson et al 2004; Bolster 2005

The Shasta chaparral is an endemic species of Shasta County. It is found within 100 meters of lightly to deeply shaded limestone rockslides, draws, or caves with a cover of shrubs or oak and is strongly associated with Shasta Lake.

The Shasta hesperian snail is endemic to the Klamath Province, primarily in the vicinity of Shasta Lake, up to 2,700 feet elevation. It has been found in moist areas, such as riparian zones, springs, seeps, marshes, and in the mouths of caves[106]. It is associated with deciduous vegetation and woody debris in perennially moist areas[107].

Multiple protocol surveys have been conducted for the terrestrial mollusk species described above along Shasta Lake. There are multiple known locations of each of these mollusks in the Pit, Squaw and McCloud Arms of Shasta Lake within the project area. Location specific data is available within the district GIS layers, NRIS database and CNDDB.

Direct and Indirect Effects from Alternative 2

These species are vulnerable to disturbance at their respective habitats. They are not highly mobile and would not be capable of avoiding disturbance. Therefore, the following design features were specifically created for this project to avoid impacts to these mollusks.

- No mechanized equipment or pile construction within 300 feet of limestone rock outcroppings.
- No habitat modification activities would take place within 250 feet of caves.
- No treatment would be permitted within 100 feet of springs or perennial seeps.

With these design features in place, no measurable or meaningful impacts to the mollusk species listed above are expected, as suitable habitat would not be removed or altered, and direct disturbance would not occur during project implementation.

Direct and Indirect Effects from Alternative 3

Impacts to these terrestrial mollusk species from Alternative 3 are not discernable from those of the Alternative 2 because the same Project Design Features would be implemented regardless of the alternative chosen and no additional areas are proposed for treatment. Potential impacts are avoided through the implementation of the Project Design Features specific to terrestrial mollusks (described above).

So, while Alternative 3 would treat fewer acres within limestone areas, the design features to protect limestone associated species in Alternative 2 would also function to do the same for Alternative 3. Therefore, no measurable or meaningful impacts to the above listed terrestrial mollusk species are anticipated from Alternative 3.

Riparian Associated Species

Riparian ecosystems generally occur as a transition zone between aquatic and upland ecosystems, and they include distinct and variable vegetation, soil and water characteristics. The associated plants and soils represent unique conditions that support a diversity of terrestrial and aquatic species and habitats. Because the following species are associated with riparian habitat, and therefore fall into a logical grouping, they will be discussed together below.

[106] Kelley et al. 1999; Duncan et al 2003
[107] Kelley et al. 1999; Duncan et al 2003

Northwestern pond turtles are associated with permanent or nearly permanent water from sea level to 6,000 feet in elevation. Western pond turtles (*Emys marmorata*) can be found in the United States from Washington to Baja, California, though the subspecies, the northwestern pond turtle, is only found in Washington through northern California, including some aquatic habitats on the Shasta-Trinity NF. This species prefers quiet stretches of moving water on ponds, lakes, major rivers and streams. Important habitat elements such as partially submerged logs, rocks, mats of floating vegetation, or open mud banks, are used as basking sites and refuge from predators. Nest sites generally occur within 0.25 miles of water sources, and are usually characterized as open areas dominated by grasses and herbaceous annuals with a southern exposure.[108] Causes of population decline include habitat loss and alteration (both aquatic sites used for feeding and basking, and nest sites), population fragmentation, predation on young, especially by raccoons and introduced predators (e.g. bullfrog), and commercial harvest for the pet trade.[109]

Distribution and abundance of northwestern pond turtles on the Forest is not well known due to a lack of survey information. It is likely that this species occurs within the project area, as suitable habitat exists along creeks and lakeshore where important habitat elements such as downed logs and matted vegetation for the basking sites exist. Data records from the district and CNDDB include 7 anecdotal sightings within the project area, though no systematic, structured surveys have been conducted.

Foothill yellow-legged frogs require relatively shallow, slow flowing water with only partial shading. Historic distributions of this species ranged through most Pacific drainages west of the Sierra/Cascade Crest, from southern Oregon to southern California. Current distribution and abundance of this species has been reduced drastically in the southern portion of its range but it still occurs throughout coastal drainages in the northern portion of its range. This species is closely associated with permanent bodies of still water and are typically found at elevations below 1,800 feet. Breeding occurs in the spring, in shallow, slow flowing water with pebble and cobble substrate, preferably with shaded riffles and pools. It is also known to occasionally use moderately vegetated backwaters, isolated pools, and slow moving rivers with mud substrates.

The foothill yellow-legged frog is at risk due to various anthropogenic and environmental threats throughout its range. Among some of the larger rivers in California, predation from introduced bullfrogs has been implicated as a cause of their decline. In addition, increased sediment loads in breeding streams have a potential to reduce survival of eggs.

No formal surveys have been conducted in the project area. Habitat for this species is present along intermittent and perennial streams. District records and CNDDB data indicate eight sightings along the Pit Arm of Shasta Lake within the perennial streams that feed into the lake.

Direct and Indirect Effects from Alternative 2

Research has shown that in general, herpetofauna will seek refuge in wet or moist microhabitats when confronted with an advancing fire[110]. The majority of impacts from proposed activities would occur upslope from the riparian areas, as prescribed fire would generally be allowed to back down from the ridges.

Current scientific literature indicates that low to moderate fire in general has little direct effect on most amphibians and reptiles, and that it can be presumed that animals associated with fire adapted

[108] Holland 1991
[109] Holte 1998
[110] Russell et al 1999

vegetation are themselves at least behaviorally adapted to resist mortality by fire. [111] If a turtle or frog was present and confronted with approaching fire it can be presumed that it would seek cover in the nearby moist areas or directly to the water. Direct effects may occur if the animal was unable to access these refugia, specifically turtles using upland areas to seek out nesting habitat; though, in general, it can be inferred that if the species is present in the area, then the appropriate moisture regime would also be present and subsequently offer refugia if needed.

Prescribed fire is indicated as an appropriate management tool that can be used with other treatments to benefit herpetofauna, and other species that are associated with riparian habitats, by restoring a historical mosaic of successional stages, habitat structures, and plant species compositions.[112] After extensive research on the effects of prescribed fire on herpetofauna, Russell (1999) concluded "although fire-induced disturbance may decrease herpetofaunal diversity within a particular patch, a mosaic of successional stages and habitat structures should increase diversity on a broader scale". [113]

While it is possible that small, isolated patches of riparian habitat may be incidentally impacted by fire, overall, the intention of the proposed activities is to restore a historical mosaic of successional stages, habitat structures, and plant species compositions to the riparian habitat while increasing the area's resiliency to wildfire. Additionally, the Aquatic Conservation Strategy would be applied to all aspects of project activities, and riparian habitats would retain their important habitat characteristics and remain intact.

No treatments would occur within 100 feet of any spring or seep (see Project Design Features). Therefore, no direct impacts to the species associated with these habitat types, such as the Shasta hesperian, are expected.

Direct and Indirect Effects from Alternative 3

No impacts are expected from Alternative 3, as this alternative treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. Impacts from Alternative 3 are not discernable from those of the Alternative 2 because the same Project Design Features would be implemented regardless of the alternative chosen and no additional areas are proposed for treatment.

VIII. Cumulative Effects

The goal of cumulative effects analysis is to provide government decision makers and the public considering proposed federal projects with comprehensive information about "the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions"(40 CFR 1508.7). In general terms, cumulative effects may arise from single or multiple actions that may result in additive, interactive, direct, or indirect effects. Cumulative watershed effects are the net impact on watersheds of multiple management activities that may coincide geographically and temporally[114].

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

[111] Russell et al. 1999
[112] ibid
[113] ibid
[114] Elliot et al 2010

The analysis area is on federal land administrated by the Shasta-Trinity National Forest. Activities on national forest land that may occur in the reasonably foreseeable future (10 years) within the analysis area are described in Table 1 in Appendix B.

There are 4,520 acres of private land inholdings within the Green-Horse project area boundary. A patch work of private land is also near and adjacent to the northern boundary of the project area. On the private timber lands it is assumed that timber harvest will continue as it has in the past. Although privately held industrial timber land is under State Board of Forestry rules, we generally assume that these lands will not support high quality habitat for any of the FS Sensitive species analyzed within this document.

A federal action within the Green-Horse analysis area has been proposed by the Bureau of Reclamation for the raising of the Shasta Lake dam. This project has been in the initial stages of review since 1998 and a "Preliminary Draft EIS" was recently conducted to assess the impacts of raising the dam 18.5 feet and the subsequent inundation of the land within this 18.5-foot zone. During the time that the Green-Horse project has been analyzed, the dam raising project has apparently made no further progress towards a more final impact analysis and subsequent decision on the feasibility of the project. Nevertheless, the proposed inundation was analyzed below for possible cumulative impacts to the species addressed within this Biological Evaluation.

Bounding

Temporal bounding for this analysis is defined by both those actions that are in the reasonably foreseeable future (10 years) and by the total time of project implementation. This bounding captures both the potential disturbance during project implementation and the potential impacts to the habitat from the proposed project.

Spatial bounding for the cumulative effects analysis is the project area boundary. The Green-Horse project area encompasses approximately 41,836 acres, and as such, is within three 5th field watersheds and encompasses all or part of sixteen 7th field watersheds.

The project boundary was chosen as the main spatial extent for the cumulative effects analysis as this boundary provides: 1) the most comprehensive display of effects to vegetation conditions (overstory and understory) from implementation of the proposed action; and 2) a large enough area to capture features such as landscape-level hydrology, soil types, etc. that may influence habitat conditions for FS Sensitive species. Where relevant, the discussion of effects may consider past, current, ongoing, and reasonably foreseeable actions outside of either boundary (e.g. the raising of Shasta Dam) having an effect on species which occur within the analysis boundary.

Therefore, the project area boundary itself would capture the cumulative impacts that may overlap in space and time with proposed activities within each treatment unit within the temporal bounding of this analysis.

Cumulative Effects from Alternative 2 – Proposed Action

As discussed in the Fire, Fuels, Air Quality and Vegetation report, there is an accumulation of abnormally dense surface and ladder fuels within the project area, increasing the likelihood of high-severity effects in the event of a wildfire. The Proposed Action would reduce the risk of high-severity fire resulting from the cumulative effects of a previous history of fire suppression, a buildup of ground and ladder fuels in the treatment units, and the potential for fire ignitions from the ongoing recreational (boating, hiking, camping) activities in the analysis area. When combined with past

projects (e.g. the Green Mountain Vegetation Management Project) and other current and future projects the collective benefit of reducing fire hazard across a broad landscape can be realized115.

Past wildfires and current or future actions involving ground-disturbing activities (e.g. timber harvest on private lands, the I-5 Corridor project) may exacerbate the human disturbance within the project area in the short term where they overlap in space and time with the proposed activities. However, the biggest agent of change that would have the most potential to cause additive impacts to many of the species described in the analysis would be the raising of Shasta Dam and the inundation of the land 18.5 feet around the entire perimeter of the lake.

If Shasta Dam were raised by 18.5 feet[116] [117] (as is currently proposed) approximately 2,498 acres of land would be inundated (1,015 within the project boundary), which would result in some loss of potential habitat for more upland species such as ***northern goshawk, Townsend's big-eared bat, pallid bat,*** and ***western red bat***, though extensive impacts to their habitat from the inundation are unlikely. And, while multiple detections of ***fisher*** have occurred along the perimeter of Shasta Lake in generally atypical habitat, it is unclear what aspect of that habitat they are using, so the effect of inundating those areas is unknown. It is possible that there will be minimal effects, as fishers are highly mobile and no denning has ever been recorded for these sightings within atypical habitat.

Raising the dam would have a greater effect on riparian-associated species such as ***foothill yellow-legged frogs*** and ***northwestern pond turtles***. However, since these species are wide spread, with both relatively abundant available habitat and a broader distribution, the impacts would still be relatively minor, though localized impacts to individuals in the inundated areas would cause habitat loss and potential mortality.

For the ***bald eagles*** that rely heavily on the habitat along the perimeter of Shasta Lake specifically, the impacts will likely be severe, but not likely to impact population viability due also to the broad distribution and relative abundance of habitat available elsewhere. However, localized impacts will be detrimental to individual bald eagle territories affected by inundation. Specifically, within the project area alone, 4 known bald eagle nests will be within the inundation zone; the Reno Canyon, Greens Creek, Flume Canyon, and Blue Canyon nests. Nest stands within this zone would be at least partially submerged and most likely die, displacing the bald eagles associated with these territories.

For local endemic species such as ***Shasta salamanders*** the impacts of this inundation may negatively affect population viability, though to what extent is not known. Of the potentially inundated lands, 114 acres are limestone, 27 acres of which is located within the project area. Shasta salamanders have an extremely narrow range of distribution and the majority of the known locations are within the limestone habitat surrounding Shasta Lake (see Map 2 in Appendix A). While some individuals have been located outside this area, the vast majority are near or adjacent to Shasta Lake. Of the known Shasta salamander locations within the project area alone, approximately 7 known Shasta salamander sites are within the inundation zone in the event of an 18.5 foot high water increase; mostly notably, all of the sites associated with the population at the mouth of Brock Creek. This constitutes a removal of approximately 15% of the occurrences within the project area and 5% of the known occurrences of this species (using the CDFG figure of approximately 213 known occurrences).

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[115] Fire, Fuels, Air Quality and Vegetation report

[116] Shasta Dam raise lake inundation GIS data were provided from Shasta-Trinity N.F. personnel. The data pertains to 1090' contour elevation information around the shoreline of Shasta Lake in Shasta County, California. The contour line was extracted from CAD data that were generated through a photogrammetry contractor per the direction of the Bureau of Reclamation.

[117] USDI Bureau of Reclamation (BOR) 2007

The same would occur for the ***terrestrial mollusk species*** associated with limestone (Shasta chaparral, Shasta sideband, and Wintu sideband). Shasta hesperian, while associated more with springs and seeps rather than limestone, would also be negatively affected by inundation, as riparian habitat is also subject to loss through inundation. These species' lack of mobility makes them particularly vulnerable to habitat destruction or loss (which is why specific Project Design Features are indicated within the Green-Horse project to mitigate any potential disturbance during implementation). There 4 known occurrences of FS Sensitive mollusks within the inundation zone within the Green-Horse project area (Shasta sideband and Wintu sideband). Undoubtedly, other occurrences will be inundated throughout the perimeter of Shasta Lake if the lake levels are raised, though exact numbers are unknown at this time. It can be reasonably assumed that an inundation to their occupied habitat would constitute a removal of that portion of the population.

Alternative 3

Cumulative effects from Alternative 3 may be somewhat reduced compared to Alternative 2, as the total acres affected by the proposed activities would be lower. However, in general, cumulative effects from Alternative 3 are the same as for Alternative 2 since the causes for potential cumulative effects are unchanged, i.e. the biggest agent of change (inundation of the lake perimeter) that would cause additive impacts remains the same. Differences in the total acres treated between the two action alternatives are not substantial enough to have a measurable or meaningful influence on the overall cumulative effects to the habitats and species described above.

IX. Effects from the No Action Alternative (Alternative 1)

Direct and Indirect Effects from Alternative 1

No direct effects are expected from Alternative 1 as no activities would take place. Potentially, indirect effects may occur if no activities were to take place that would reduce the fire resiliency of the project area and high intensity wildfires occur that result in further loss of habitat for the species described above. Because of the high risk to the area from additional high severity fires, an increased importance is placed on conducting actions that would reduce this risk, increase the resiliency of the area, and return the area to a more natural fire regime.

Cumulative Effects from Alternative 1

Because no action would be implemented that would be additive to other past, current and reasonably foreseeable actions in the project area, there would be no cumulative effects to FS Sensitive species with implementation of this alternative. However, if fuels are allowed to continue to accumulate untreated, the likelihood of these high levels of ground and ladder fuels possibly burning, or re-burning in the event of an unplanned fire is increased. This, combined with past fire suppression, past wildfires (see Table 1 in Appendix B) and ongoing fire suppression would create long-term effects such as a highly increased likelihood of a high-severity fire occurring, and thus damaging or removing current and potential habitat for the FS Sensitive species described above. Adversely impacted habitats may then have adverse effects on species abundance and distribution.

X. Determination

Based on the above analysis of the proposed **Green-Horse Project**, using the most current available science, it is my determination for **both action alternatives** that:

Implementation of the proposed project *may affect individual **bald eagles** but would not cause a trend toward federal listing or a loss of viability* based upon the following rationale:

- Limited operating periods would avoid disturbance to active nests during sensitive reproductive periods.
- Nesting habitat would not be removed or degraded.
- For Alternative 2: treatments within bald eagle territories are designed to benefit bald eagle habitat and increase resiliency of the stand to loss from high severity wildfire.

Implementation of the proposed project may impact individual **Pacific fisher** but would not would not result in population level impacts or a loss of viability[118] based upon the following rationale:

- According to the USFWS[119], threats to fisher are from habitat loss and fragmentation due to timber harvest, roads, urban development, recreation, and wildfires. Other threats include small population sizes and isolation, predation, and human-caused mortality from vehicle collisions, poaching, and incidental capture and injury[120]. Prescribed fire, or the activities associated with it, are not described as a threat to fisher population viability and are not expected to have any deleterious impacts to the population[121].
- Fisher populations are susceptible to habitat loss and fragmentation in addition to genetic isolation and high mortality rates from fur trapping[122]. The proposed activities do not include any of these threats, and instead would likely result in a beneficial impact from a reduction in the susceptibility of fisher habitat to loss from intense wildfire.
- Fishers are mobile and will move away from sources of disturbance.
- The probability of losing fisher habitat from high severity fire would be reduced.
- Standards and Guidelines in the LRMP would be met within the project area post-treatment for Riparian Reserves and snag/downed log levels.

Implementation of the proposed project *may affect individual **Shasta salamanders** but would not cause a trend toward federal listing or a loss of viability* because the following protective measures would be in place to avoid impacts to this species:

- No line construction would occur during times of potential surface activity within 300 feet of limestone outcroppings, as determined by the district wildlife biologist and the Shasta salamander survey protocol.
- No noise-generating or habitat modification activities would take place within 250 feet of caves.
- No mechanized equipment or pile construction would occur within 300 feet of limestone outcroppings.

Implementation of the proposed project may affect individual **northern goshawks** but would not cause a trend toward federal listing or a loss of viability based upon the following rationale:

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[118] Generally, the analysis for Forest Service sensitive species focuses on whether or not the action "is likely to lead to a trend in Federal listing." However, the U.S. Fish and Wildlife Service has already listed the fisher as Proposed. Therefore, we have evaluated whether the proposed project would impact population viability of fisher in the analysis area.

[119] USDI 2010a
[120] USDI 2010a
[121] USDI 2010a
[122] Ruggiero et al 1994.

- Goshawks are unlikely to occupy the project area, as very little suitable habitat is present.
- The small amount of possible nesting habitat present in the area has a limited operating period in place for NSO that would overlap for the majority of goshawk nesting season as well. Proposed activities would not occur during the time between the *end* of the NSO LOP (July 10) and the *end* of goshawk nesting season (August 15) as the weather and fuels conditions would be out of prescription during these summer months.
- Because adult goshawks are highly mobile, and can fly away from an oncoming source of disturbance such as fire, the probability is low that individuals may be injured or killed during project implementation.
- The proposed activities would result in a beneficial impact from a reduction in the susceptibility of the suitable habitat in the project area to loss from intense wildfire and return the area to a more natural fire cycle and subsequent fire resiliency.

Implementation of the proposed project may affect individual **Townsend's big-eared bats** but would not cause a trend toward federal listing or a loss of viability based upon the following rationale:

- Primary threats to Townsend's big-eared bats (TBEB) are a general lack of roosts and human disturbance to their roost sites, particularly during the reproductive or nursery period from spring to early summer[123]. Project Design Features intended specifically for bat species will alleviate impacts to this species from the proposed activities. No noise-generating or habitat modification activities will take place within 250 feet of caves, mine shafts and mine adits to protect known or potential Townsend's big-eared bat, and other bat species, roost sites. This design feature will not only protect this species from direct impacts in the form of human disturbance, but it will also ensure that the microclimate within the cave remains intact by retaining the vegetation at or near the opening of the potential roost site. So, none of the important habitat features specific to TBEB would be affected by implementation of the proposed activities.
- Caves and rock crevices used as roosts throughout the year would not be meaningfully impacted by the proposed activities, due to both the 250 foot protection buffer and because fire generally doesn't affect rocks and rocky outcroppings.
- Timing of proposed activities does not coincide with periods of reduced mobility, particularly summer maternity roosting (when females and young are roosting together in larger groupings and are vulnerable to disturbance) because the hot, dry conditions would be out of the burn prescription.

Implementation of the proposed project may affect individual **pallid bats** but would not cause a trend toward federal listing or a loss of viability based upon the following rationale:

- Caves and limestone rock outcroppings will have a protection buffer (described above), so any roosting bats within these areas would not be affected.
- Fire lines will be re-opened along lines that have already been created at some point in the past, and as such will be unlikely to contain suitable bat roosting habitat such as large snags.
- Disturbance in general from human activity in the area during prescribed burning activities has the potential to disrupt bat behavior if bats were present in the area at the time, but they are highly mobile when not hibernating or in maternity roosts and can move away from a disturbance, especially of the type that is non-recurring and transient, as would be expected from the proposed activities.

Implementation of the proposed project may affect individual **western red bats** but would not cause a trend toward federal listing or a loss of viability based upon the following rationale:

- Impacts from the proposed activities are not expected, due to the low likelihood of occurrence and the lack of expected impacts to the habitat they utilize.

[123] Pierson and Rainey 1997; Pierson and Rainey 2007; Gruver 2006; Sherwin 2000

- In addition, this is a highly mobile species and if present, would be able to retreat to areas less affected by disturbance.
- Habitat for red bats in the project area is extremely limited and would not be extensive enough to support large numbers of individuals, thereby limiting the number of red bats potentially affected.
- No suitable habitat would be removed or altered. Red bats roost in the foliage of the upper canopies of mature riparian forests, generally in the largest trees available, and are dependent upon relatively extensive stands of this riparian forest. There is very little, mature riparian forest within the affected drainages, and no known areas of mature cottonwoods or sycamores. The majority of the areas to be treated are upslope from the riparian areas, and though fire would be allowed to back down, with low intensity, to drainages, no loss of large overstory trees within riparian areas is expected.

For species associated with riparian habitats, implementation of the proposed project may affect individual **northwestern pond turtles, Shasta hesperian snails** or **foothill yellow-legged frogs** but would not cause a trend toward federal listing or a loss of viability based upon the following rationale:

- Impacts to the species associated with the riparian habitat in the project area are expected to be negligible, as the Aquatic Conservation Strategy would be applied to all aspects of project activities, and riparian habitats would retain their important habitat characteristics and remain intact.
- Prescribed fire is indicated as an appropriate management tool that can be used with other treatments to benefit herpetofauna by restoring a historical mosaic of successional stages, habitat structures, and plant species compositions.
- The majority of the areas to be treated are upslope from the riparian areas where the species described above would occur. Prescribed fire would be allowed to back down from the ridges, and **would not be ignited directly within any drainage or riparian area**.
    - Animals associated with fire adapted vegetation are themselves at least behaviorally adapted to resist mortality by fire. Research has shown that in general, herpetofauna will seek refuge in wet or moist microhabitats when confronted with an advancing fire.

For Shasta hesperian snails

- No treatments would occur within 100 feet of any spring or seep where this species would occur, so impacts are not expected.

Implementation of the proposed project may affect individual **Shasta chaparral, Shasta sideband**, and **Wintu sideband** but would not cause a trend toward federal listing or a loss of viability because suitable habitat would not be removed or altered, and direct disturbance would not occur during project implementation because the following protective measures would be in place to avoid impacts to these species:

- No mechanized equipment or pile construction would occur within 300 feet of limestone outcroppings.
- No noise-generating or habitat modification activities would take place within 250 feet of caves.

Implementation of the proposed project *will not affect* the ***willow flycatcher*** because it is highly unlikely that this species occurs in the project area as no riparian shrub (specifically willow) habitat of sufficient size and composition as to provide suitable habitat for willow flycatchers is within or near the proposed treatment areas. Riparian habitat present in the project area is both too small and of the wrong species composition to accommodate the habitat preferences of this species. Therefore, no suitable habitat will be affected by the proposed treatments.

Implementation of the proposed project *will not affect* the ***wolverine*** because it is extremely unlikely that this species occurs in the project area as it is unsuitable due to the low elevation, the lack of substantial snow accumulation during winter or spring, and the high human activity in the area.

Implementation of the proposed project *will not affect* the ***American marten*** because it is extremely unlikely that marten occupy the area due to its low elevation and unsuitable vegetation composition.

Implementation of the proposed project *will not affect* ***Cascade frog*** the because the project area does not contain suitable habitat for the Cascade frog, as the area is too low in elevation, with a temperature and moisture regime that is too dry and hot, and does not contain the types of water bodies and microclimates preferred by this species.

Implementation of the proposed project will not affect the southern torrent salamander because the project area is within a temperature and moisture regime that is too dry and hot for this species to tolerate. In addition, the microclimate, vegetative composition, and bodies of water preferred by this species are not present in the project area.

XI. References and Literature Cited

Anthony, R.G., R.L. Knight, G.T. Allen, B.R. McClelland and J.I. Hodges. 1982. Habitat use by nesting and roosting bald eagles in the Pacific Northwest. Trans. N. Am. Wildl. Nat. Res. Conf. 68 pp.

AmphibiaWeb: Information on amphibian biology and conservation. [web application]. 2012. Berkeley, California: AmphibiaWeb. Available: http://amphibiaweb.org/. (Accessed: Nov 5, 2012).

Austen, K. 1994. Habitat Use and Home Range Size of Breeding Northern Goshawks in the Southern Cascades. M.S. Thesis Oregon State University. 57pp.

Blaustein, A.R., J.J. Beatty, D.H. Olson, and R.M. Storm. 1995. The biology of amphibians and reptiles in old-growth forests in the Pacific Northwest. U.S. Forest Service. Pacific Northwest Research Station. General Technical Report PNW-GTR-337.

Bolster, B. C. 2005. Species Account: Western Red Bat (*Lasiurus blossevillii*). Prepared for the Western Bat Working Group. Updated 2005 for Portland Biennial Meeting. http://www.wbwg.org.

Buskirk, S.W. and L.F. Ruggiero. 1994. American marten. Pages 7-37 *in* L.F. Ruggiero, K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, eds. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine in the western United States. U. S. Forest Service Gen. Tech. Rep. RM-254.

Buskirk S.W., Powell RA. 1994. Habitat ecology of fishers and American martens. In: Buskirk SW, Harestad AS, Raphael MG, Powell RA, editors. Martens, sables and fishers: biology and conservation. Ithaca (NY): Cornell University Press. p 283-296.

Birds of North America http://bna.birds.cornell.edu/bna accessed July 24, 2011.

California Dept. of Fish and Game 2012. Shasta Salamander Web Site. Interior Timberland Planning, Habitat Conservation Program, Northern Region. Redding, California. Accessed: September 2012. https://r1.dfg.ca.gov/portal/itp/Fisheries/ShastaSalamander/tabid/671/Default.aspx

Carroll C.R., Zielinski W.J., Noss R.F. 1999. Using presence/absence data to build and test spatial habitat models for the fisher in the Klamath region, USA. *Conservation Biology* 13(6):1344-59.

California Dept. of Fish and Game. 2010. Status Review for the Fisher (*Martes pennant*) in California. February 2010.

Corn, J.G. and Raphael, M.G., 1992. Habitat characteristics at marten subnivean access sites. *Journal of Wildlife. Management* 56, pp. 442–448.

Duncan, N., T. Burke, S. Dowlan, P. Hohenlohe. 2003. Survey Protocol for Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan. 70pp.

Elliot, William J.; Miller, Ina Sue; Audin, Lisa. Eds. 2010. Cumulative watershed effects of fuel management in the western United States. Gen. Tech. Rep. RMRS-GTR-231. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 299 p.

Frest, T.J. and E.J. Johannes. 1999. Field Guide to Survey and Manage Freshwater Mollusk Species. Bureau of Land Management, Oregon State Office, Portland, Oregon. 117 pp.

Furnish, J., T. Burke, T. Weasma, J. Apellegarth, N. Duncan, R. Monthey, and D. Gowan. 1997. Survey Protocol for Terrestrial Mollusk Species from the Northwest Forest Plan. Draft Version 2.0. October 29, 1997.

Furnish, J. and Monthey, R. 1998. Management recommendations for survey and manage aquatic mollusks. Version 2.0. USDA Forest Service and USDI Bureau of Land Management, OR, WA, and CA.

Furnish, J. 2005. Sensitive Aquatic Mollusks of the U.S. Forest Service Pacific Southwest Region. Unpublished report, USDA Forest Service.

Gruver, J.C. and D.A. Keinath. 2006. Townsend's Big-eared Bat (*Corynorhinus townsendii*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/townsendsbigearedbat.pdf

Harris, John E., and Chester V. Ogan., Eds. 1997. Mesocarnivores of Northern California: Biology, Management, and Survey Techniques, Workshop Manual. August 12-15, 1997, Humboldt State Univ., Arcata, CA. The Wildlife Society, California North Coast Chapter, Arcata, CA. 127 p.

Holte, D.L. 1998. Nest site characteristics of the western pond turtle at Fern Ridge Reservoir in west central Oregon. MS. Oregon State University. 106pp.

Kelley, R., S. Dowlan, N. Duncan, and T. Burke. 1999. Field Guide to Survey and Manage Terrestrial Mollusk Species from the Northwest Forest Plan, U.S. Department of the Interior, Bureau of Land Management, Oregon State Office. June 1999

Kennedy, P.L. and J. B. Fontaine. 2009. Synthesis of Knowledge on the Effects of Fire and Fire Surrogates on Wildlife in U.S. Dry Forests Special Report 1096, September 2009.

Lewendal, P. 1995. Habitat Use by the Shasta Salamander (*Hydromantes shastae*). October 1995.

Lindstrand, L. K. Bainbridge, G. Youngblood. 2012. Habitat characteristics, a range extension, and an elevational record for Shasta salamanders. California Fish and Game 98(4):236-241; 2012.

Moriarty, K. 2008. American Marten Distributions over a 28 Year Period: Relationships with Landscape Change in Sagehen Creek Experimental Forest, California, USA. University of Oregon, M.S. Thesis. 108pp.

Naumann, R.S. and D.H. Olson. 2004. Surveys for terrestrial amphibians in Shasta County, California, with notes on the distribution of Shasta Salamanders (*Hydromantes shastae*). Northwestern Naturalist 85:35-38.

Olson, D. H. and P.C. Lewendal. 1999. Survey Protocol for the Shasta salamander (*Hydromantes shastae)* Chapter III. In: Survey Protocols For Amphibians Under the Survey and Manage Provision of the Northwest Forest Plan. BLM, Oregon. Version 3.0. October 1999. http://www.blm.gov/or/plans/surveyandmanage/SP/Amphibians99/protoch.pdf

Pallid Bat Recovery Team (PBRT). 2008. Recovery Strategy for the Pallid Bat (*Antrozous pallidus pallidus*) in British Columbia. Prepared for the B.C. Ministry of Environment, Victoria, B.C. 18 pp.

Pierson E.D. and W.E. Rainey. 2007. Bat distribution in the forested region of northwestern California. Report prepared for the California Department of Fish and Game. Contract Number FG-5123-WM. Sacramento, California, USA

Pierson, E.D., W.E. Rainey and C. Corben. 2006. Distribution and status of Western red bats (*Lasiurus blossevillii*) in California. Calif. Dept. Fish and Game, Habitat Conservation Planning Branch, Species Conservation and Recovery Program Report 2006-04, Sacramento, CA 45 pp.

Pierson. E.D. and W.E.Rainey. 1997. Distribution, Status, and Management of Townsend's big-eared bat (Corynorhinus townsendii) in California. BMCP Technical Report Number 96-7. State of California Dept. of Fish and Game, Wildlife Management Division, Bird and Mammal Conservation Program. 34pp.

Powell R.A, Zielinski WJ. 1994. Fisher. In: Ruggiero LF, Aubry KB, Buskirk SW, Zielinski WJ, tech. editors. The scientific basis for conserving forest carnivores: American marten, fisher, lynx, and wolverine. Fort Collins (CO): USDA Forest Service, Rocky Mtn. Forest and Range Exp. Station. GTR-RM-254. p 38- 73.

Reynolds, R.T., R.T. Graham, and D.A. Boyce, Jr. 2006. An ecosystem-based conservation strategy for the northern goshawk. *Studies in Avian Biology* 31:299-311.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon, and W.J. Zielinski, technical editors. 1994. The Scientific Basis for Conserving Forest Carnivores: American marten, fisher, lynx, and wolverine in the United States. USDA-FS, General Technical Report RM-254. 183 pp. http://www.fs.fed.us/pnw/publications/pnw_gtr285/

Russell, K. R., D.H. Van Lear, D.C. Guynn, Jr. 1999. Prescribed fire effects on herpetofauna: review and management implications. *Wildlife Society Bulletin* 27(2):374-384.

Seglund A.E. 1995. The use of rest sites by the Pacific fisher [MSc thesis]. Arcata (CA): Humboldt State University. 66 pp.

Self SE, Kerns SJ. 2001. Pacific fisher use of a managed forest landscape in northern California [Unpublished report]. Redding (CA): Sierra Pacific Industries. Available at http://www.spind.com/Our_Forests/PDF/WRPNo6.pdf.

Sherwin, E.R., D. Stricklan and D.S. Rogers. 2000. Roosting affinities of Townsend's big-eared bat (*Corynorhinus townsendii*) in northern Utah. *Journal of Mammalogy* 81(4):939–947.

Smith, J.K., L.J. Lyon, M.H. Huff, R.G. Hooper, E.S. Telfer, D.S.Schreiner. 2000. Wildland Fire in Ecosystems: Effects of Fire on Fauna. USDA Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-42-volume 1, January 2000.

Spinks, P. Q., G.B. Pauly, J.J. Crayon, H.B. Shaffer. 2003. *Biological Conservation* 113 (2003) 257-267.

Squires, J.R. and R.T. Reynolds. 1997. Northern Goshawk. *In* The Birds of North America, No. 298 (A. Poole and F.Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.

Thelander, C.G. and M. Crabtree. 1994. Life on the Edge: A Guide to California's Endangered Wildlife. Biosystems Books.

USDA Forest Service 1991. Forest Service Manual Chapter 2670 - Threatened, Endangered, and Sensitive Plants and Animals. USDA Forest Service, Washington, DC.

USDA. U. S. Forest Service. 1995. Shasta-Trinity National Forest Environmental Impact Statement Land and Resource Management Plan. Redding, CA.

USDA Forest Service. 1998a. Lower McCloud River Watershed Analysis. Shasta-Trinity National Forest. Shasta-McCloud Management Unit. Redding, CA.

USDA 1999. Shasta-Trinity National Forest, Forest-wide LSR Assessment.

USDA/USDI 2001. Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines.

USDA Pacific Northwest Research Station: Forest Carnivore Surveys in the Pacific States. 2010. Database: http://maps.fs.fed.us/carnivore//Modules/application/home.html

USDA Forest Service. 2010. Pit Arm of Shasta Lake Watershed Analysis. Shasta-Trinity National Forest. NRA and Shasta Lake Management Units. Redding, CA.

USDI Fish and Wildlife Service. 2006. Notice of Candidate Review for the Pacific fisher.

USDI Fish and Wildlife Service. 2007. National Bald Eagle Management Guidelines. U.S. Fish and Wildlife Service.

USDI Fish and Wildlife Service. 2010a. 12 month finding for the pacific fisher. Federal Register /Vol. 75, No. 73 / Friday, April 16, 2010 / Proposed Rules 50 CFR Part 17 [Docket No. FWS–R6–ES–2010–0017] [MO 92210–0–0008] Endangered and Threatened Wildlife and Plants; 90-Day Finding on a Petition to List a Distinct Population Segment of the Fisher in Its United States Northern Rocky Mountain Range as Endangered or Threatened with Critical Habitat

USDI Fish and Wildlife Service. 2010b. Federal Register 12 month finding on petition to list the wolverine. Federal Register / Vol. 75, No. 239 50 CFR Part 17 [Docket No. FWS–R6–ES–2008–0029; MO 92210–0–0008–B2] Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition To List the North American Wolverine as Endangered or Threatened AGENCY: Fish and Wildlife Service.

Welsh, H. and A. Lind. 1996. Habitat Correlates of the Southern Torrent Salamander, *Rhyacotriton variegatus* (Caudata: Rhyacotritonidae), in Northwestern California. Journal of Herpetology Vol. 30; No. 3, pp. 385-398.

Woodbridge, B.; Detrich, P. J. 1994. Territory occupancy and habitat patch size of Northern Goshawks in the southern Cascades of California. In: Block, W. M.; Morrison, M. L.; Reiser, M. H., eds. The Northern Goshawk: ecology and management: Proceedings of a

symposium of the Cooper Ornithological Society; 1993 April 14-15; Sacramento, CA. Studies in Avian biology. Cooper Ornithological Society 16: 83-87.

Woodbridge, W. and P.J. Detrich. 1994. Territory Occupancy and Habitat Patch Size of Northern Goshawks in the Southern Cascades of California. *Studies of Avian Biology* No. 16:83-87.

Yeager, S.J. 2005. Habitat at fisher resting sites in the Klamath Province in Northern California. MS Thesis Humboldt State University, Arcata, California. 64pp.

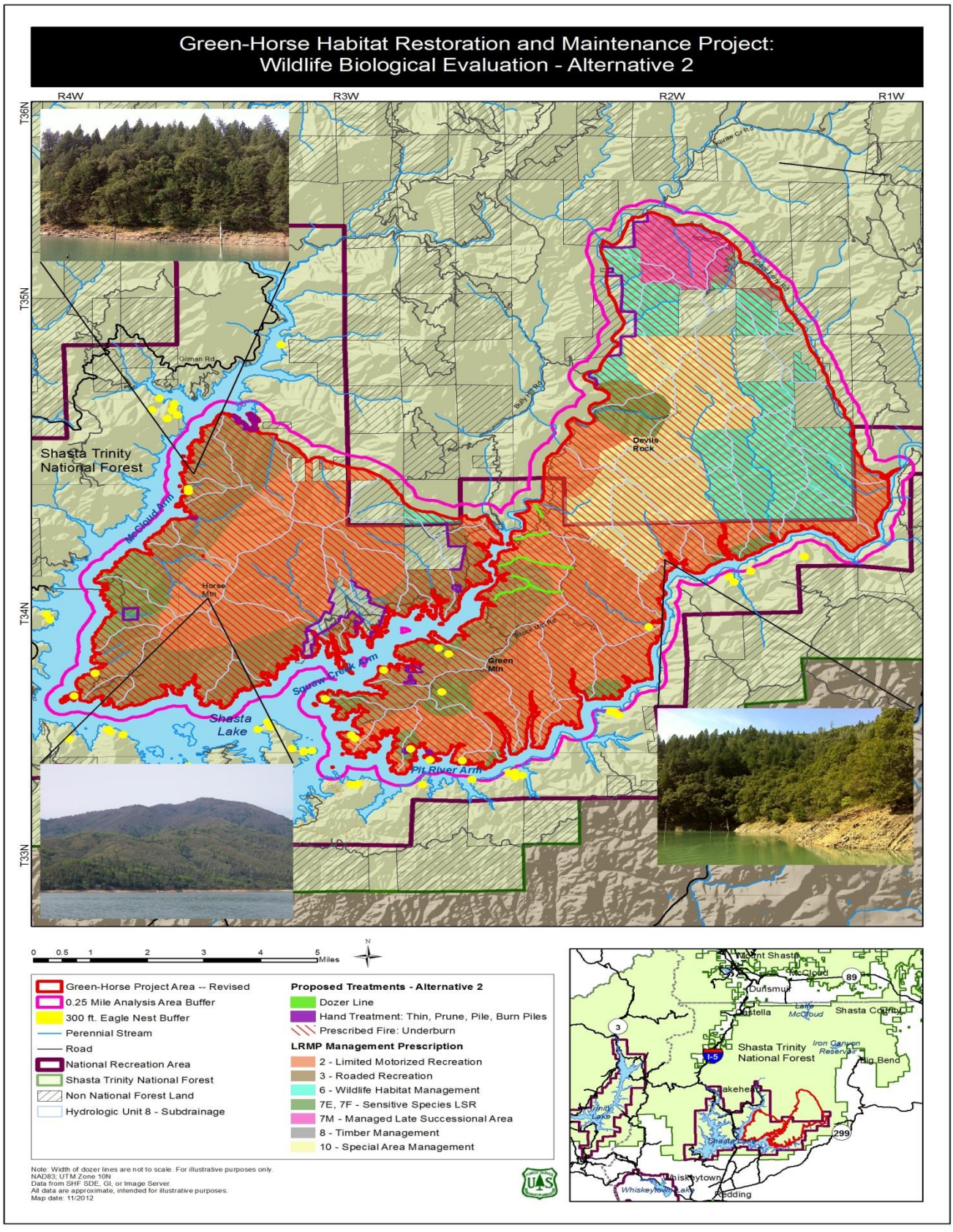
Zielinski, W.J., R.L. Truex, G. Schmidt, R. Schlexer, K.N. Schmidt, and R.H. Barrett. 2004. Resting habitat selection by fishers in California. *Journal of Wildlife Management* 68:475-492.

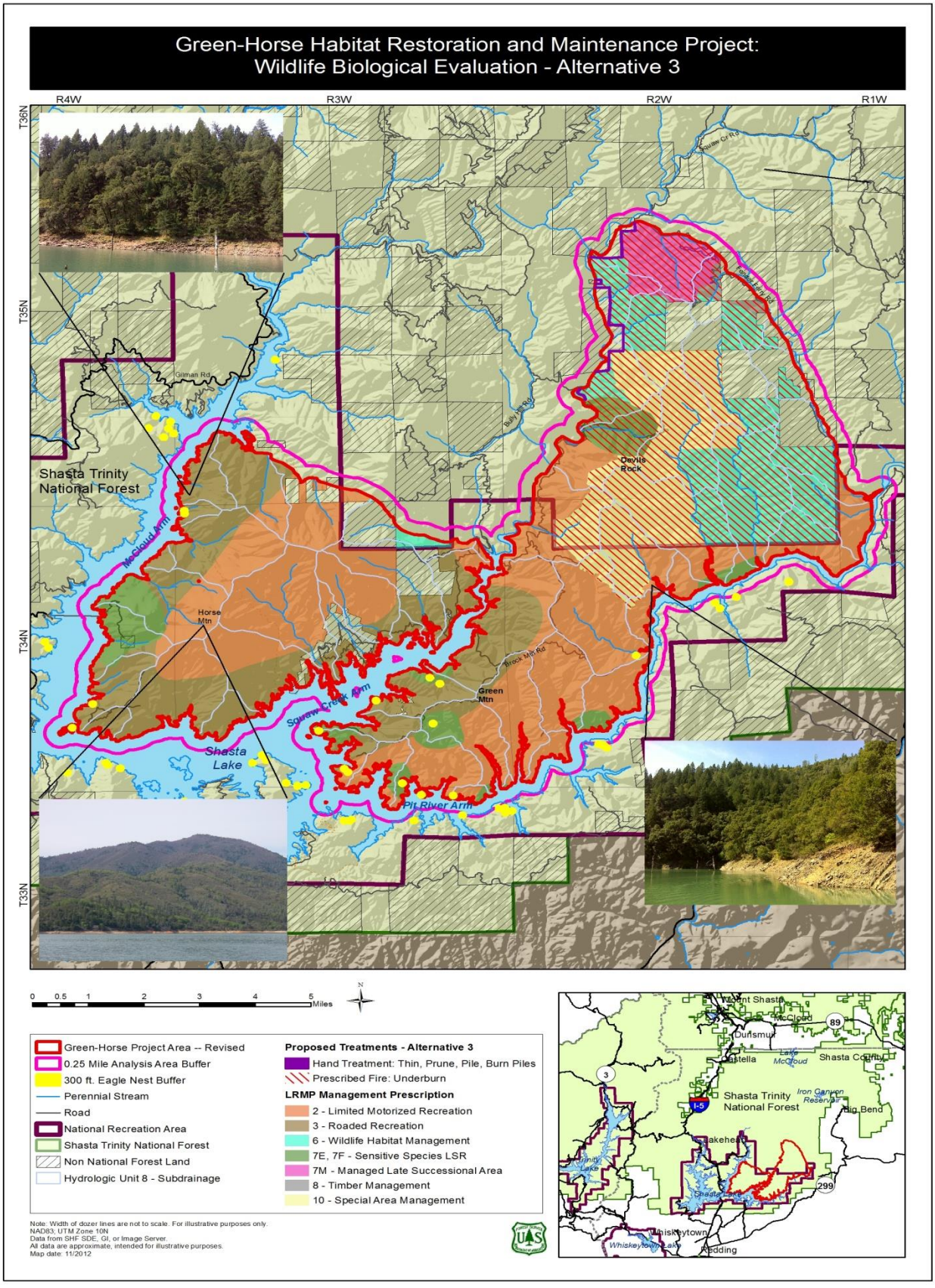
Zielinski, W.J., et al. 2010. Developing and testing a landscape-scale habitat suitability model for fisher (*Martes pennanti*) in forests of interior northern California. *Forest Ecology and Management* (2010),doi:10.1016/j.foreco.2010.08.006.

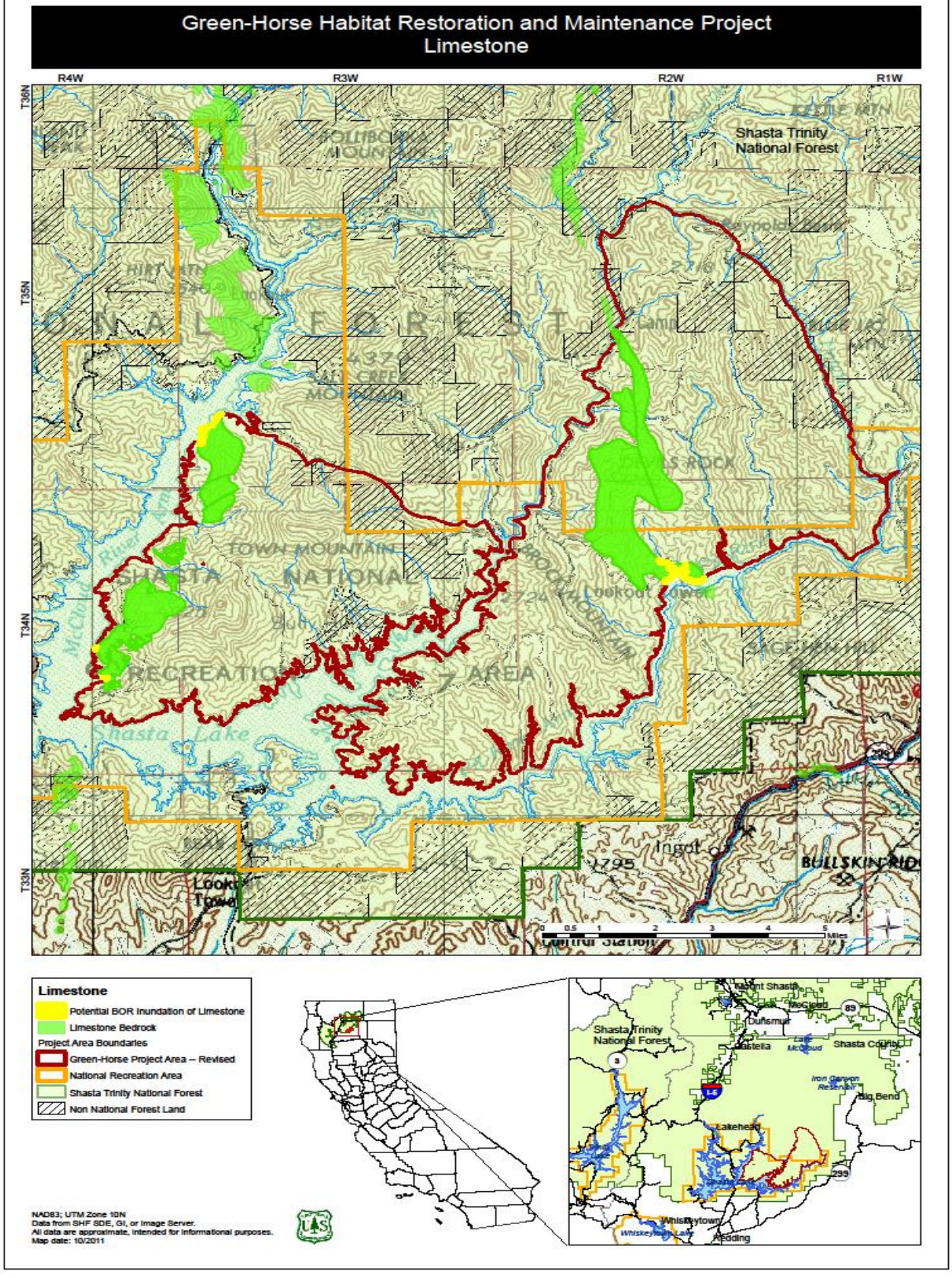
Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1988. California's wildlife: Volume I: Amphibians and Reptiles. Calif. Dept. of Fish and Game, Sacramento, CA. 407 pp.

Zeiner, D.C., W.F. Laudenslayer, Jr., K.E. Mayer and M. White. 1990. California's wildlife: Volume III: Mammals. Calif. Dept. of Fish and Game, Sacramento, CA. 407 pp.

Appendix A – Maps


Green-Horse Habitat Restoration and Maintenance Project:
Wildlife Biological Evaluation - Alternative 2
R4W
R3W
R2W
R1W
T36N
T35N
T34N
T33N
Shasta Trinity National Forest
Gilman Rd
Bully Hill Rd
Devils Rock
McCloud Arm
Horse Mtn
Squaw Creek Arm
Green Mtn
Shasta Lake
Pit River Arm
0 0.5 1 2 3 4 5 Miles
N
Green-Horse Project Area -- Revised
0.25 Mile Analysis Area Buffer
300 ft. Eagle Nest Buffer
Perennial Stream
Road
National Recreation Area
Shasta Trinity National Forest
Non National Forest Land
Hydrologic Unit 8 - Subdrainage
Proposed Treatments - Alternative 2
Dozer Line
Hand Treatment: Thin, Prune, Pile, Burn Piles
Prescribed Fire: Underburn
LRMP Management Prescription
2 - Limited Motorized Recreation
3 - Roaded Recreation
6 - Wildlife Habitat Management
7E, 7F - Sensitive Species LSR
7M - Managed Late Successional Area
8 - Timber Management
10 - Special Area Management
Note: Width of dozer lines are not to scale. For illustrative purposes only.
NAD83, UTM Zone 10N
Data from SHF SDE, GI, or Image Server.
All data are approximate, intended for illustrative purposes.
Map date: 11/2012
Mount Shasta
McCloud
Dunsmuir
Castella
Lake McCloud
Shasta County
Shasta Trinity National Forest
Iron Canyon Reservoir
Big Bend
Lakehead
Trinity Lake
Shasta Lake
Whiskeytown
Whiskeytown Lake
Redding
89
3
I-5
299


Green-Horse Habitat Restoration and Maintenance Project:
Wildlife Biological Evaluation - Alternative 3
R4W
R3W
R2W
R1W
T36N
T35N
T34N
T33N
Shasta Trinity
National Forest
Gilman Rd
Squaw Cr Rd
Fenders Ferry Rd
Bully Hill Rd
Devils Rock
McCloud Arm
Horse Mtn
Brock Mtn Rd
Green Mtn
Squaw Creek Arm
Shasta Lake
Pit River Arm
0 0.5 1 2 3 4 5 Miles
N
Green-Horse Project Area -- Revised
0.25 Mile Analysis Area Buffer
300 ft. Eagle Nest Buffer
Perennial Stream
Road
National Recreation Area
Shasta Trinity National Forest
Non National Forest Land
Hydrologic Unit 8 - Subdrainage
Proposed Treatments - Alternative 3
Hand Treatment: Thin, Prune, Pile, Burn Piles
Prescribed Fire: Underburn
LRMP Management Prescription
2 - Limited Motorized Recreation
3 - Roaded Recreation
6 - Wildlife Habitat Management
7E, 7F - Sensitive Species LSR
7M - Managed Late Successional Area
8 - Timber Management
10 - Special Area Management
Note: Width of dozer lines are not to scale. For illustrative purposes only.
NAD83; UTM Zone 10N
Data from SHF SDE, GI, or Image Server.
All data are approximate, intended for illustrative purposes.
Map date: 11/2012
Mount Shasta
McCloud
89
Dunsmuir
Castella
Lake McCloud
Shasta County
3
Shasta Trinity National Forest
Iron Canyon Reservoir
I-5
Big Bend
Lakehead
Trinity Lake
Shasta Lake
299
Whiskeytown
Whiskeytown Lake
Redding


Green-Horse Habitat Restoration and Maintenance Project
Limestone
R4W
R3W
R2W
R1W
T36N
T35N
T34N
T33N
Shasta Trinity
National Forest
Limestone
Potential BOR Inundation of Limestone
Limestone Bedrock
Project Area Boundaries
Green-Horse Project Area -- Revised
National Recreation Area
Shasta Trinity National Forest
Non National Forest Land
NAD83; UTM Zone 10N
Data from SHF SDE, GI, or Image Server.
All data are approximate, intended for informational purposes.
Map date: 10/2011
Mount Shasta
McCloud
Dunsmuir
Castella
Shasta County
Big Bend
Lakehead
Whiskeytown
Redding
299
89
5

Appendix B

Reference table of past, present and potential future projects and known wildfires in the three 5th field watersheds within the Green-Horse analysis area.

Project Name	Date	Activity Type	Location (by HUC5 WA)	Activity Description	Acres/Miles
Bear Fire	2004	Wildfire	Pit Arm Shasta Lake, Little Cow Creek	Wildfire	10,442
Bear Fuels Fire Recovery Project (Bear Helicopter Salvage portion)	5/4/2005	Fire/Fuels	Pit Arm Shasta Lake	Helicopter Salvage	Approximately 336 acres salvage logged.
Bear Hazardous Fuels Reduction Project	6/29/2009	Fire/Fuels	Pit Arm Shasta Lake	Reduce wildland fire risk and improve forest health by removing dead and dying trees, thinning overstocked stands, reducing shrub cover, and removing ladder fuels in the Jones Valley area. Thin, pile and burn, chip. Also replanting of trees.	Approximately 350 to 400 acres completed to date within a boundary of 4465 acres.

Project Name	Date	Activity Type	Location (by HUC5 WA)	Activity Description	Acres/Miles
Bear Mountain Fire Salvage Timber Sale	8/21/1991	Silviculture	Pit Arm Shasta Lake	Site prep (burning, mechanical); tree release and weed, salvage thin, tree planting	Fire perimeter is 1,444 acres. At least 45 acres was treated
Bureau of Reclamation - Shasta Dam and Reservoir	Proposed	Eng.	All	Proposed raising of Shasta Dam	Inundation {GH Area (total is 1015 ac/fed lands is 998 ac/private is 17ac); for terrestrial perimeter around lake is 2498 acres ((calc'd from 1090 lake level acres of 32436))} minus 1070 lake level acres of 29938).
Clikapudi Trail Loop Addition Project	10/24/2006	Recreation	Pit Arm Shasta Lake	The project involves construction of approximately one mile of new non-motorized, singletrack trail for mountainbike use.	approximately 1 mile
Elk Trail Water System Upgrade-Reauthorization	**Proposed**	Special Uses	Pit Arm Shasta Lake	Replacement of intake pumps, burial of water mains and electrical conduits, construction of 100 sq. ft water tanks, possible building expansion (700 feet), addition of 3 200-ft long pipelines.	approximately 1 acre (of NFS lands)
Fountain Fire	1992	Wildfire	Pit Arm Shasta Lake, Burney Creek, Little Cow Creek, Lake Britton, Pit-Roaring Creek	Wildfire	60,290

Project Name	Date	Activity Type	Location (by HUC5 WA)	Activity Description	Acres/Miles
Garden Ridge Prescribed Burn	7/28/1998	Fire/Fuels	Squaw Creek	prescribed fire to 1200 acres of mixed conifer forest and montane chaparral in the Squaw Creek watershed	approximately 1200 acres
Gilman Road Shaded Fuelbreak	6/5/2003	Fire/Fuels	McCloud Arm	Thin and Chip; (Thin, Pile, and Pile Burn; Pesticide application)	Approximately 132 acres
Green Mountain Vegetation Management Project	5/4/2001	Fire/Fuels	Squaw and Pit Arm	Rx fire before 2009; Rx fire of 2009; Rx fire of 2010	5,193 acres 2002-2007; 806 acres in 2009; 1,044 acres in 2010; Boundary is 7,130 acres
Hawkins I and II	1983-1997	Patch clearcuts, broadcoast burning, pile and burn.	Squaw Creek (barely) and Lower McCloud River (mainly)	Timber Sale.	Over 300 acres approximately.
Hornet Timber Sale	1980s	Cutting, planting, stocking surveys	Squaw Creek (barely) and Lower McCloud River (mainly)	Timber Sale.	41 acres total.
Horse Mountain Prescribed Burning	12/11/1997	Fire/Fuels	Pit Arm Shasta Lake	Prescribed burn within the Shasta Unit Management Area to remove dense and decadent vegetation, improve wildlife habitat, and reduce the chance of a catastrophic wildfire. Treatment method will utilize a helitorch to apply fire to pre-selected areas	2,500 - 3,000 acres
I-5 Corridor Fuels Reduction Project	**Proposed**	Fire/Fuels	Sacramento Arm, McCloud Arm, and	Fuels Reduction (Hand Thin, Prune, Pile, Pile Burn, Mastication, Rx Fire)	33,700 acres within project boundary

Project Name	Date	Activity Type	Location (by HUC5 WA)	Activity Description	Acres/Miles
			Pit Arm		(20,025 proposed for treatment)
Jones Fire	1999	Wildfire	Pit Arm Shasta Lake, Little Cow Creek, and Sacramento River/Stillwater	Wildfire	26,202
Jones Valley Master Plan	**Proposed**	Special Uses	Pit Arm Shasta Lake	Issue 30-year special use permit for management of Jones Valley, Lakeview & Sugarloaf marinas. Permit will cover existing uses and planned uses (e.g., campground & expanded floating facilities) and requires completion of master development plan.	approximately 15 acres
Lakeview Marina Master Plan	**Proposed**	Special Uses	McCloud Arm	Permit renewal of the Marina	approximately 15 acres
Lower McCloud Fuels Management Project	**Proposed**	Fire/Fuels	Pit River, Lower McCloud River	Prescribed burn and fuel break construction	72,219 boundary; 22,399 treatment acres planned so far (21,149 Rx fire, 1,250 FMZ)
Murphy Fire	2008	Wildfire	Pit Arm Shasta Lake and Squaw Creek	Wildfire	51 acres total - all within the project boundary
Northwoods Vegetation Management Project	9/3/2003	Fire/Fuels	Pit Arm and E. Sac Arm	Rx fire; (Thin, Pile, and Pile Burn)	1,293 acres project boundary ((96 acres Rx burn; 179 acres of thin, pile, and pile burn))
Packers Bay Invasive Plant Species Removal Project	**Proposed**	Botany	Pit Arm Shasta Lake and E. Sacramento Arm	Removal of non-native Scotch, French & Spanish brooms using an integrated approach on NFS lands. A combination of treatments,	112 acres

Project Name	Date	Activity Type	Location (by HUC5 WA)	Activity Description	Acres/Miles
				including herbicide, manual cutting, hand pulling & prescribed fire will be used.	
Reynolds Great Basin Timber Sale	1997-2008	Thinning, silvicultural prescriptions	Squaw Creek (barely); Pit Arm (barely) and Pit Roaring Creek (mainly)	Timber Sale.	525 Acres
SHU Lightning Complex Fires	2008	Wildfire	Pit Arm Shasta Lake, Little Cow Creek, and Pit Roaring	Lightning fire.	41,363 total - all outside the project boundary
Timber Harvest Activities	1997 – 2007 and ongoing	Timber Harvest Private Lands	Within McCloud Arm, Pit Arm, and Squaw Creek	Clearcuts, Shelterwood Cuts, Rehabilitation	ACRES NOTES: 366 gis acres within project area (their total for these THPs is 678 acres). 202 acres labeled 'complete'/ 164 acres labeled approved but not yet complete/ NAIP imagery shows likely completion already (see GIS file)
Travel Management	3/11/2010	Engineering	All	Provides motorized travel management direction across the entire Forest	Entire Shasta Trinity National Forest boundary (2 million + acres federal, 1 million + acres private)

Appendix C

Addendum to the Wildlife reports conducted for the Green-Horse Habitat Restoration and Maintenance Project

National Recreation Area Management Unit
Shasta-Trinity National Forest
Shasta County

Patricia Johnson
Project Wildlife Biologist
December 2013

Summary

A Wildlife Biological Evaluation was completed in December 2012, and a Wildlife Biological Assessment was completed and signed on October 19, 2012 for the Green-Horse Habitat Restoration and Maintenance project (Green-Horse project) on the National Recreation Area Management Unit of the Shasta-Trinity National Forest. The original reports are on file at the Shasta Lake district office and contain the details on the proposed action and other alternatives, the affected environment and additional information for analysis.

Since that time the R5 Regional Forester's Sensitive Species List was updated in July, 2013. This addendum analyzes the additional Forest Service Sensitive Species that may occur within the project area (see details below).

In addition, rules regarding surveys for Survey and Manage species changed as a result of a 9th Circuit Court reversal of the District Court's approval of the 2011 Settlement Agreement (see details below).

Also, Critical Habitat for the northern spotted owl was revised and a new ruling was published in November 2012. The Green-Horse project area was not included in the final designation of Critical Habitat (see details below).

Changes to the R5 Regional Forester's Sensitive Species List

Four terrestrial species that are either known to occur or have their historic range on the Shasta-Trinity National Forest were added to the R5 Regional Forester's Sensitive Species List (a.k.a. Forest Service Sensitive Species) during its revision in July 2013. This occurred after the completion of the project Biological Evaluation, but before the finalization and signing of the EIS.

Summary of effects to R5 Regional Forester's Sensitive Species

No changes to the Green-Horse Project are warranted to maintain consistency with the intent of the Forest Service Sensitive Species Program to avoid causing a trend towards federal listing or a loss of viability

for any species appearing on the R5 Regional Forester's Sensitive Species List (dated July 3, 2013). This determination is based upon this supplemental analysis (below) that reveals that the project would have no effect on three of the four new terrestrial species on the list for the Shasta-Trinity National Forest (western bumble bee, yellow rail, and northern red-legged frog) and may impact individuals but would not cause a trend towards federal listing or a loss of viability for that species for the remaining one species from the list (fringed myotis).

Changes to designated NSO Critical Habitat

Critical habitat for the northern spotted owl was revised and published in November 21, 2012, *after* the original Biological Assessment for this project was completed and signed. The final ruling on Critical Habitat did not include the Green-Horse project analysis area. The determination of '*no effect*' to NSO Critical Habitat remains.

Changes to rules regarding Survey and Manage species

Forest Service guidance under the Northwest Forest Plan and the Shasta-Trinity National Forest Land and Resource Management Plan (Forest Plan) requires the agency to analyze projects for potential impacts to Survey and Manage Species. Survey and Manage requirements were originally established to address little-known species that were believed to be associated with old-growth and late-successional forest micro-habitats, and for which species experts were unsure whether or not the Late-Successional Reserve (LSR) system was sufficient to provide for their conservation.

The Survey and Manage program is a result of the 2001 Record of Decision and Standards and Guidelines for Amendments to Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines (USDA and USDI 2001). The species listed in the 2001 Survey and Manage Record of Decision (ROD) were selected "to more efficiently provide the level of species protection intended in the Northwest Forest Plan...for the management of habitat for late-successional and old-growth forest related species within the range of the northern spotted owl." (ROD p. 1). Modifications to the requirements in the ROD included a Settlement Agreement filed on July 6, 2011, in Conservation Northwest et al. v. Sherman, Case No. C08-1067-JCC (W.D. Wash).

On April 25, 2013 the 9th Circuit Court reversed the District Court's approval of the 2011 Settlement Agreement, concluding that "Because the consent decree allows for substantial, permanent amendments to Survey and Manage, it impermissibly conflicts with laws governing the process for such amendments" (*Conservation Northwest et al. v. Sherman*, No. 11-35729 [9th Cir.] No. 08-1067-JCC [W.D.Wash]). The 9th Circuit Court remanded the decision to the District Court for further proceedings consistent with its opinion. As a result, the 2011 Settlement Agreement is invalid and the order issued by Judge Coughenour on December 17, 2009 is still valid. As a result we are currently working under the 2001 Survey and Manage Record of Decision.

In addition, four exempted habitat disturbing activities, or projects, are in place from the October 11, 2006 modified injunction order in *Northwest Ecosystem Alliance v. Rey (Case 2:04-cv-00844-MJP, Doc. No. 109)*. Thus, these exempted activities (listed below) can proceed and do not require surveys.

- Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
- Thinning projects in stands less than 80 years old;
- Riparian and stream improvements projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trial decommissioning; and where the stream

improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions;

- **The portions of projects involving hazardous fuel treatments where prescribed fire is applied**. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to survey and manage requirements except for thinning of stands younger than 80 years old.

Surveys for species described as Survey and Manage under the Northwest Forest Plan were not performed for the proposed project, as non-commercial fuels treatment such as prescribed burning is indicated as exempt from required survey under 'Pechman Exemptions'.

In addition, to be in compliance with the 2001 ROD, projects require pre-disturbance surveys if the activity is considered "habitat-disturbing." "Habitat-disturbing activities" are defined as "those disturbances likely to have a significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements" (Survey and Manage ROD Standards and Guidelines (S&G), p. 22). Described within the Survey and Manage S&Gs, "The line officer should seek specialists' recommendations to help determine the need for a survey based on site-specific information. In making such determination, the line officer should consider the probability of the species being present on the project site, as well as the probability that the project would cause a significant negative effect on the species habitat or the persistence of the species at the site." (2001 ROD S&G, p. 22).

The following project design features for the Green-Horse project were developed in order to protect sensitive limestone habitats where Survey and Manage terrestrial mollusks and Shasta salamanders may occur:

- No line construction during times of potential surface activity (for Shasta salamander) within 300 feet of limestone outcroppings, and;
- No mechanized equipment or pile construction within 300 feet of limestone outcroppings.
- Only hand line will be constructed within 300 feet of limestone outcroppings or known occupied sites.

Therefore, through the use of these activity/equipment exclusion zones and the restriction of the timing of ground disturbing activities to times when the species in question are not likely to be present in the affected areas, *"significant negative impact on the species' habitat, its life cycle, microclimate, or life support requirements*" for Survey and Manage species with the potential to occur in the project area are avoided.

Supplemental Analyses for R5 Forest Service Sensitive Species

The purpose of this supplement is to present the likely effects of the Green-Horse project to the Forest Service Sensitive Species that have been added to the R5 Regional Forester's Sensitive Species List since the completion of the original project Biological Evaluation. The following terrestrial species from the newly revised list were analyzed for impacts from the proposed project: ***Fringed myotis, western bumble bee, yellow rail, and northern red-legged frog.***

The following analyses used the same spatial and temporal bounding, analysis methodology, project design features and protective measures as were used for the original Green-Horse project Biological Evaluation.

Fringed myotis

Life History

Fringed myotis (*Myotis thysanodes*) is predominantly a western bat species occurring from southern British Columbia, Canada (where it is only known from a few specimens), south through southern Mexico. It occurs west to the Pacific coast and east to the Rocky Mountains, with an isolated population in the Black Hills of South Dakota and Wyoming. Populations in Mexico don't reach either coast, being found predominantly in the central highlands. Occurrences have been documented in 14 states (Arizona, California, Colorado, Idaho, Nebraska, New Mexico, Montana, Nevada, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming) (Keinath 2003).

Fringed myotis are generally found between 3,000 to 5,000 feet in elevation, though will occasionally occur in lower elevations near coastal areas. They occur within a broad range of vegetative types but are mostly commonly reported to occur in pinyon juniper, oak, ponderosa pine and mixed conifer forest types (Keinath 2004).

Throughout the research, factors described as most important to the conservation of fringed myotis are: to delineate local populations and insure that 1) key life history stages are not disturbed; 2) once disturbance has been minimized, the necessary habitat mosaic is present for persistence of those populations, 3) given appropriate habitat suitability, exposure to potentially detrimental chemicals is eliminated, and 4) populations are non-invasively monitored to determine trends (Keinath 2003).

According to conservation assessments done for states such as Wyoming and South Dakota, in order to insure persistence of the species on the landscape, the following conservation actions must address a combination of issues that when conducted simultaneously will determine species persistence: roost protection, habitat management, landscape management, reduction of chemical exposure, and population monitoring.

Specific aspects of the life history of bats in general, and specifically fringed myotis, make them vulnerable to extirpation. An interagency expert evaluation panel considered the fringed bat to be more vulnerable to alteration of mature forest ecosystems than most bat species because it depends on old-growth conditions (i.e., forests with abundant, large snags suitable for roosting), is rare, occurs in a restricted elevation zone, and has strong site fidelity (Forest Ecosystem Management Assessment Team FEMAT 1993), in addition to increased sensitivity to roost disturbance, restrictive hibernation requirements, and low reproductive capacity (Keinath 2004, Christy and West 1993). Although their range is large, fringed myotis are rare and patchily distributed within that range and require a specific and restrictive combination of habitat characteristics (Keinath 2004). In addition, strong site fidelity has been demonstrated both at the stand and roost scale. Maternal colonies, in particular, will show a high preference for specific roost caves and/or watering places, where they will return over the course of a summer and from one summer to the next (Keinath 2004, Lewis 1995).

Suitable roosting sites, including maternity roosts, diurnal and nocturnal roosts and winter hibernacula, are a critical habitat component, the availability of which can determine population sizes and distributions (Keinath 2004, Humphrey 1975).

Nocturnal and Diurnal Roosts

Due to their wide distribution and variety of habitats used, fringed myotis will use a wide variety of structures as roosts. In studies in northern California male and female fringed myotis used tree snags exclusively for day roosts (Weller and Zabel 2001). In areas where snags are the most common type of roost, vegetative structural complexity of habitat around roost sites is likely more important than plant species composition or general topographic features in determining distribution of this species (Keinath 2004).

Fringed myotis in northern California tend to select large snags within small openings surrounded by contiguously forested areas. These microsites tend to have a lower canopy closure, greater than or equal to 75%, when compared to the surrounding areas with over 90% closure. They also choose areas with a higher density of large snags (>30cm dbh) than the surrounding forest. In other words, roost trees are in open microsites in otherwise contiguous forests, but not out in the open (Weller and Zabel 2001). Roost snags also tend to be taller relative to the surrounding canopy than random snags and are generally nearer to stream channels than randomly selected points (Weller and Zabel 2001). When roosting in snags, this species will roost under loose bark; therefore, roost snags (in northern California) are almost always in decay classes 2, 3 and occasionally 4[124] (Weller and Zabel 2001).

Abundance of large snags within microsites with a lower canopy cover allows more thermal heating of roosts, easier flight access to roosts, and the ability to readily switch roosts in the event of roost collapse, for predator avoidance, or to find more suitable microclimates (Lewis 1995, Weller and Zabel 2001). When necessary, fringed myotis have been known to switch roosts several times a week.

While fringed myotis have been shown to regularly use tree snags for day roosts, as described above, recent studies east of the Cascades in Oregon and Washington have shown that they use trees/snags as roosts much less than previously reported for this portion of their range (Lacki and Baker 2007). Fringed myotis will use caves, mines, and buildings as solitary day and night roosts, and hibernacula. They will also use bridges and rock crevices as solitary day and night roosts and have been shown to use lava flows on at least one occasion (Christy and West 1993). Roosts in these more permanent structures elicit high roost fidelity as compared to more temporary roosts such as trees and snags (Lewis 1995, Weller and Zabel 2001).

Bats using abundant but ephemeral roosts (e.g., tree foliage or snags) are more closely tied to a home range with a variety of roosts available rather than bats that roost in more permanent but scarce habitat features (e.g., caves). Studies in northern California showed a low fidelity to individual roost snags but high fidelity to the specific areas in which those snags occurred (Weller and Zabel 2001). Shifting between roosts occurs on a daily basis (Weller and Zabel 2001), so specific roost trees that may be heavily used over a longer period of time, may not be used at all on any given night (Weller and Zabel 2001).

Maternity Roosts

Maternity colonies can be found in caves, mines, abandoned buildings, bridges, and rock crevices; and consist entirely of adult females and pups and can range in size from a few dozen bats to several hundred (Keinath 2004, Keinath 2003). Young will leave the maternity roost soon after weaning while the adult females will continue to use the roost until late summer/fall when they will depart for winter hibernacula.

Foraging habitat

Fringed myotis are morphologically adapted to forage in areas of relatively high vegetative clutter, such as interior forests and/or their edges, not wide openings such as clear-cuts or meadows, where their chief prey taxa (coleopterans) would be less abundant. Fringed myotis living in temperate forests (as opposed to desert dwellers) must drink water shortly after emerging from their day roost each evening, and may require up to half their body weight in water each day depending on the type of prey consumed (Christy and West 1993, Keinath 2004). Likely due to this aspect of their biology, they are generally found to roost in areas within close proximity to a water source, though the size and extent of that source can be highly variable.

[124] Snags are generally considered Decay Class 1 for the first 5 years following mortality as per Common Stand Exam field guides.

Hibernacula

Few hibernacula have been well documented, but those that have are generally cool and usually in caves or mines with little temperature fluctuation throughout the winter. They have also been found to hibernate in buildings and mines along the coast range north of San Francisco Bay (Pierson and Rainey 2007). Unlike other bats that aggregate in high numbers to hibernate, fringed myotis has been shown to hibernate in small numbers where hibernacula are known to occur.

It is possible that fringed myotis occur in the project area, as the important habitat elements are present in the area and this species has been found on the Shasta-Trinity National Forest (STNF), though only a rare occurrence (Pierson and Rainey 2007). Surveys have been done on the east side of the STNF, sampling for a wide variety of bats and this species was detected, though relatively rare as compared to other bat species captured. There are no records in CNDDB or NRIS for this species in the project area. During their telemetry studies and surveys of northern California, including many areas on the Shasta-Trinity NF, Pierson and Rainey (2007) concluded that fringed myotis was rare and likely occurred in available rock crevices and caves, though one roost was found in a cat face of a large redwood tree (live). Of their nineteen study sites throughout a six county area, fringed myotis was only detected in four sites and represented less than 1% of the total captures.

Direct and Indirect Effects – Proposed Action

Effects to potential day roosts

Any change in habitat that modifies microclimate in and near roosts (e.g., airflow and/or thermal regime) can substantially impact the suitability of the both the foraging habitat outside the roost and the microclimate within the roost itself. Daily energy budgets of bats are in delicate balance, and anything that alters this balance can result in lowered fecundity, mortality, or roost abandonment (Keinath 2004). Modification of cave and mine entrances, including substantial vegetative alterations outside the entrances, can alter thermal and airflow characteristics of roosts. This also applies to non-permanent roosts such as tree snags. Modification of the forest around snags can alter solar and wind exposure, thereby making an otherwise suitable roost unfit for bat occupancy because it is too hot or cold to allow bats to effectively thermoregulate.

A few smaller caves occur near the northern boundary of the project area and rock crevices exist throughout the project area. In addition, limestone outcroppings occur in several areas within the project area boundary, though these areas would not be directly impacted by the proposed treatments. Protective measures in place for other FS Sensitive bat, amphibian and terrestrial mollusk species (see below) would also serve to protect the most important habitat elements for fringed myotis.

Large snags are also present in the project area that could be used as day roosts if located in the appropriate microclimate. It is possible that snags may catch fire during burning operations, though this is an uncommon occurrence when burning under the weather and fuel conditions prescribed for burning operations. Snags are not proposed for intentional felling unless they pose a threat to human safety during operations; therefore risk of loss due to direct felling is extremely low. The transient nature of snags as day roosts makes their loss less of an impact to the species, in part because of their overall abundance and also because they are much more easily replaced than more permanent and reproductively important structures such as caves, mines, buildings, and rock outcroppings.

It is important to emphasize the low likelihood of fringed myotis occurring in the project area, and the subsequent low likelihood of the proposed project impacting a roost site or an individual during implementation, as this species is very rare and sparsely distributed within its range.

Effects to foraging habitat

Prescribed fire is a way in which larger, more intense wildfires, with the potential to remove or severely reduce the canopies and basal areas of large forested areas, may be avoided.

Little is known about the use of burned forests by fringed myotis, or other bat species, but the inference is made that without the microclimates within the higher canopy closure and multi-layered forest vegetation preferred by this species, that they would no longer use the affected areas. No roosts have been detected in areas of high or moderately burned forests, and this species is morphologically adapted to forage in a high clutter environment within more densely forested areas (Keinath 2004).

So, while prescribed fire has the potential to reduce the risk of loss of suitable forested habitat from high severity wildfire, it would also temporarily remove portions of vegetation that fringed myotis could use for foraging. However, a mosaic of burned and unburned vegetation is planned for each treatment unit. Therefore, while some areas containing suitable habitat may be burned during project implementation, at no point would all of the available habitat be impacted and the bats could readily move to undisturbed areas as necessary. This, in combination with the low likelihood that this species would occur in the project area, greatly reduces the potential for effects to this species through impacts to its foraging habitat.

Effects to potential maternal roosts and hibernacula (caves, mines, and rock outcroppings)

The key to population viability for the fringed myotis is the survival of reproductive females (Keinath 2004, Weller and Zabel 2001, Buchalski et al 2013). Disturbance and/or destruction of the areas where they tend to congregate and have the most site fidelity (i.e. caves, mines, rock crevices and buildings) would have the greatest impact on the species. Because structures such as caves, mines, or buildings would not be removed or altered with the project activities, and if discovered in the project area, would be protected from disturbance (with LOPs) and habitat modification (with protection buffers), the disruption to key life history stages for fringed myotis, i.e. breeding and hibernating females, are avoided; therefore, population level impacts are not expected. Project design features for other FS Sensitive bat species described below, specific to caves, cave-like structures, and rock outcroppings would preclude disturbance to potential roosts and/or hibernacula.

No noise-generating or habitat modification activities would take place within 250 feet of caves, mine shafts and mine adits to protect known or potential Townsend's big-eared bat and other bat species roost sites.

No activities will occur that would modify the trees or vegetation outside the entrance of the cave for a distance of 250 feet, to protect the microclimate within the cave.

No line construction during times of potential surface activity (for Shasta salamander) within 300 feet of limestone outcroppings.

No mechanized equipment or pile construction within 300 feet of limestone outcroppings. Only hand line will be constructed within 300 feet of limestone outcroppings or known occupied sites.

These protective measures would dramatically decrease the potential for direct impacts to important roost sites and/or hibernacula. The most important aspects of this species life history, i.e. maternal/ nursery roosts and maternal hibernacula, are protected through design features; therefore if this species is present in the project area, population level effects are not expected. Additional project design features are described in the Green-Horse project original Biological Evaluation, Biological Assessment, and Environmental Assessment.

Direct and Indirect Effects – Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. All project design features described for Alternative 2 would be applied in Alternative 3, though there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used; however, dozer line construction in Alternative 2 would not occur within areas of limestone outcrops, caves or cave-like structures, therefore impacts from dozer line construction were not anticipated for Alternative 2.

Alternative 3 treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. With a reduction in overall treatment, it would follow that a reduction in potential impacts would occur. However, meaningful or measurable impacts were not anticipated for this species from the Alternative 2, so it would also follow that impacts from treating a reduced number of acres with Alternative 3 would be the same.

The direct and indirect effects from Alternative 3 for the fringed myotis are not discernable from the impacts described above for Alternative 2 because treating fewer acres of very similar habitat under the same burning conditions and the same project design features would have no meaningful additional impacts to these species.

Cumulative Effects

See the Cumulative Effects analysis within the project Biological Evaluation.

Determination: May impacts individuals, but not likely to lead to a trend to federal listing.

Western bumble bee

Life History

Populations of western bumble bees (*Bombus occidentalis*) in states along the west coast of the U.S. have declined dramatically since the 1990's. Prior to 1998, the western bumble bee was both common and widespread throughout the western United States and western Canada. The U.S. states included in the former range of this species are: northern California, Oregon, Washington, Alaska, Idaho, Montana, western Nebraska, western North Dakota, western South Dakota, Wyoming, Utah, Colorado, northern Arizona, and New Mexico. Since 1998, this bumble bee has undergone a drastic decline throughout some areas of its former range. While viable populations still exist in Alaska and east of the Cascades in the Canadian and U.S. Rocky Mountains, the once common populations of central California, Oregon, Washington and southern British Columbia have largely disappeared.

The recent dramatic decline of the western bumble bee in the west is speculated to be due to disease. The western bumble bee pollinates numerous crops and is easy to rear and manage, and is why the species was raised commercially for pollination of greenhouse crops (Rao and Stephens 2007). In the mid to late 1990's native bumble bee queens were captured in the United States and transported to Holland and used to start colonies that were later returned to the United States (Rao and Stephens 2007). Rearing stocks were also shifted from California to a rearing facility in Michigan (Thorp 2008). Western bumble bees were reared in the same facility as other bumble bee species and became infected with pathogens to which

they had previously never been exposed (Rao and Stephens 2007; Evans et al 2008; Thorp 2013 pers. comm.). Because bumble bees are deployed for pollination at high densities, (as many as 23,000 individuals per greenhouse), they are particularly vulnerable to pathogens and parasites (Rao and Stephens 2007). It is currently speculated that commercial rearing and export of western bumble bees resulted in the unintentional transport of parasites and diseases, possibly causing its dramatic decline and potential extirpation from the west coast of the United States in very recent years (Rao and Stephens 2007).

Other threats to western bumble bees described in the literature include habitat alteration/removal in the form of agricultural intensification, livestock grazing, urban development and landscape fragmentation, which can reduce pollen and nectar sources and affect current and potential nest sites. Use of broad-spectrum herbicides can also reduce pollen and nectar sources. Additional threats to this species include invasive species, use of insecticides and climate change. Fire suppression may in time result in conversion of open meadows to forested habitats, potentially reducing availability of meadow nest sites for this species (Evans et al. 2008, Koch et al. 2012, Xerces Society 2013). The impacts from these threats are exacerbated by the already extremely low numbers of the species in the wild.

Foraging

Western bumble bees are generalist foragers, feeding on pollen and nectar from a diverse array of plant species. Research has indicated that foraging flight ranges of worker bees were approximately 3km (Rao and Stephens 2007). Bumble bee colonies depend on floral resources for their all their nutritional needs. Nectar provides them with carbohydrates and pollen provides them with protein. As generalist foragers, they do not depend on any one flower type, though some plants rely specifically on bumble bees to achieve pollination (Xerces 2013). They are commonly found in riparian habitats, meadows and recently disturbed areas that contain abundant flowering plants. In studies in the Sierra Nevada, bumble bee abundance was found to be positively influenced by presence and proportion of meadow in the surrounding habitat, in addition to meadow wetness (Hatfield and LeBuhn 2007).

Reproduction

Western bumble bees primarily nest underground, typically in abandoned rodent nests located from six to eighteen inches below the surface (Thorp et al. 1983; Laverty and Harder 1988). Nests are often in abandoned rodent burrows, and less frequently in abandoned bird nests or open grassy areas (Evans et al. 2008, Koch et al. 2012, Xerces Society 2013). Thus, nesting sites may be limited by the abundance of rodents and the presence of undisturbed grassy areas.

Colonies are annual, with colonies started by solitary queens in the spring, then the production of workers, and finally to production of queens and males (Evans et al 2008, Xerces 2013). Queens produced at the end of the colony cycle mate before hibernation, then emerge in spring and begin their search for appropriate nesting sites. The queen collects nectar and pollen from flowers to support the production of her eggs, which are fertilized by sperm she has stored since mating the previous fall (Evans et al 2008). In the early stages of colony development, the queen is responsible for all food collection and care of the young. As the colony grows, workers take over the duties of food collection, colony defense, and care of the young. The queen then remains within the nest and spends most of her time laying eggs. Colonies typically consist of between 50 and 400 workers at their peak (Thorp et al. 1983; Macfarlane et al. 1994) along with the queen. During later stages of colony development, new queens will be produced as well as males.

Queen production is dependent on access to sufficient quantities of pollen. The amount of pollen available to bumble bee colonies directly affects the number of queens that can be produced (Burns 2004 *as cited in*

Evans et al 2008). Since queens are the only bumble bees capable of forming new colonies, pollen availability directly impacts future bumble bee population levels.

Since bumble bee colonies obtain all their nutrition from pollen and nectar, they need a constant supply of flowers in bloom. Therefore, western bumble bees require habitats with rich supplies of floral resources with continuous blooming from spring to autumn, though not all flowers are of equal value to bumble bees. Also, western bumble bees have short tongues, on average, measuring around 5 to 7 mm in length, as compared to other bumble bees which have tongues as long as 10 mm (Thorp et al 1983). Because of their short tongues they are not able to properly access the nectar in flowers with deep tubes. They will sometimes use their mandibles to chew holes in the bottom of these flowers to access the nectar from the outside of the flower, thus cheating the flower of pollination.

Bumble bee species richness and abundance are strongly influenced by patch size and larger landscape level habitat quality; indicating that small, isolated patches of habitat are not sufficient to fully support bumble bee populations (Hatfield and LeBuhn 2007). Therefore, the promotion and protection of large areas with flowering resources is prioritized in habitat management for this species.

The likelihood that western bumble bees occupy the Green-Horse project area is low due to the increasingly rare distribution and abundance of the species. Dr. Robbin Thorp[125] has extensively searched several sites in southern Oregon (Mt. Ashland and Grants Pass vicinity) and northern California (Mt. Shasta vicinity) where western bumble bees were commonly found in the past. He has found only one individual since 2002 (Evans et al 2008). In yearly surveys of southern Oregon and northern California sites in which a total of 15,573 bumble bees were observed from 1998 to 2007, 102 individual western bumble bees were observed in 1998, nine in 1999, one in 2000, one in 2001, one in 2002, and none in 2003 to 2007 (Evans et al 2008). In 2008, a single specimen was captured on Mt. Ashland in Oregon in a survey that included over 2,000 bees that were caught in blue vane traps. An additional 2,000 bumble bees were examined foraging at flowers; no western bumble bees were observed.

In the Willamette Valley of Oregon, researchers reported that western bumble bees were not seen from the summer of 1997 through 2005; then three specimens were collected in 2006 and three more were collected in 2007 (Rao and Stephen 2011). In 2007 over 20 specimens were collected in eastern Oregon, though they were quite rare, making up less than half of one percent of the relative abundance of all bumble bees collected in the survey. In 2008-2009, while several thousand bumble bees belonging to 12 other species were captured, no western bumble bees were detected in over 100 traps placed at various locations in the same region (Rao and Stephen 2011), indicating that although present, this species is still extremely rare.

Due likely to the very recent addition of this species to the R5 Regional Forester's Sensitive Species List (July 2013), this species is not listed in CNDDB and past detections on the Shasta-Trinity have not been entered into the NRIS database; therefore, these standard information sources were not useful in this analysis. Species specific surveys have not been conducted in the project area. However, through examination of research papers, district records, and personal communication with bumble bee expert Dr. Robbin Thorp (UC Davis), historic and current sightings and location information for this species was obtained for this analysis. Detection information was obtained from published bumble bee guides and research papers (Koch et al. 2012; Hatfield et al. 2012). No detections have been made in the project area, though the area is within the species' range.

So, while potential habitat exists in the project area, it is unlikely that this species is present, at least to any extent, based on this species' rarity. However, because the habitat in the project area is generally less

[125] UC Davis - bumble bee expert

fragmented and affected by current threats to bumble bees (i.e. urbanization, agriculture, pesticides, and exposure to commercially raised bees) it may be of a potentially higher quality than other, more fragmented areas of the forest. In addition, livestock grazing does not occur in the project area, allowing for native flowering resources to grow, particularly in early seral habitat resulting from past wildfires.

Direct and Indirect Effects – Proposed Action

In the unlikely event that western bumble bees do use the project area, project activities may temporarily displace individual foraging bees during project implementation. This species is a generalist forager and not restricted to any one plant, and is therefore capable of utilizing a wide variety of flowering resources; such that if an area containing one type of flower (i.e. flowering *ceonothus* spp.) is impacted during operations, this species can readily move to another area with other types of flowering vegetation.

Direct impacts could occur to underground nests if they were to occur directly within the areas used for dozerlines. Nests occur primarily underground located from six to eighteen inches below the surface (Thorp et al. 1983; Laverty and Harder 1988). Nests are often in abandoned rodent burrows, and less frequently in abandoned bird nests or open grassy areas (Evans et al. 2008, Koch et al. 2012, Xerces Society 2013). Depending on the depth and level of compaction of soil along the intended dozerline, an unknown nest could be crushed if located close enough to the surface; nests located deeper into the ground may avoid being crushed. However, the likelihood of such a rare species not only occurring in the project area but also having its nest located exactly in the path of the intended dozerline is extremely low. Impacts arising from this exact set of circumstances are not effectively measurable, but would be highly unlikely to result in population-level effects.

Indirect effects to foraging habitat may occur during project implementation when flowering resources may be burned. Prescribed burning can temporarily reduce the abundance flowering plants in a specific area, particularly if done while flowering, but can also improve availability of this resource in the long term by causing increased nutrient availability in the soil and removing encroaching woody vegetation. However, if done too often or over an *entire* area of available flowering resources, effects can be detrimental to western bumble bees and pollinators in general. Recommendations for prescribed fire use in bumble bee conservation describe using low intensity fire, over a third of the total area to be treated at a time, burning from October to February if possible, and leaving patches of unburned habitat to serve as refuge within burned areas (Hatfield et al 2012).

The Green-Horse project will potentially be accomplishing all of these recommendations, though the time of year may not always be from October to February. Because the project area is lower in elevation and can be accessed more readily in the winter, it is very possible that the recommended timeline is used. A mosaic of burned and unburned vegetation is planned for each treated area. In addition, the vast majority of the available bumble bee habitat in the project area would be unaffected by the proposed activities, thereby allowing any bumble bees in treatment areas alternative areas to forage if disturbed.

This project does not include the use of pesticides or herbicides, so there will be no impacts to western bumble bees from their use.

Measurable or meaningful impacts to western bumble bees are not expected from project activities for the following reasons:

- This species is unlikely to occur in project area due to its overall rarity.
- This species is a generalist forager and not tied to any one species of plant and is therefore capable of transitioning to other flowering resources located away from project activities.

- In any given year, large areas of habitat would be left untreated, leaving food sources in areas adjacent to treated areas unaffected.
- A mosaic of burned and unburned habitat will be present throughout the project area.
- No pesticides or herbicides will be used, thereby precluding impacts to bumble bees from their use.

Direct and Indirect Effects – Alternative 3

Total acres of prescribed burning and hand treatment are reduced in Alternative 3, as the Forest Plan amendment that would facilitate these actions would not be completed. Alternative 3 proposes 13,247 acres of prescribed burning, a difference of 28,378 acres as compared to the Proposed Action. All project design features described for Alternative 2 would be applied in Alternative 3, though there would be no dozer line construction with Alternative 3; only handline and natural barriers and ridges would be used. Without dozerline construction, the risk of crushing potential nests is avoided, though this occurrence would be very unlikely.

Alternative 3 treats a subset of Alternative 2 and no other, new areas would be affected by proposed activities. Treating fewer acres would result in less habitat improvement for flowering and/or herbaceous vegetation and subsequently fewer available nectar sources for bumble bees. Low intensity prescribed fire is described in bumble bee conservation guidelines as highly beneficial to bumble bee foraging habitat when done under specific conditions (Hatfield et al. 2012), as would be done with the proposed action. Alternative 3 would result in reduced benefits to bumble bee foraging habitat, but would reduce the risk of nest loss from dozerline construction.

Cumulative Effects

Due to the lack of expected direct or indirect effects, cumulative effects are also not expected.

Determination: No Effect based on rationale described above.

Yellow Rail

The yellow rail (*Coturnicops noveboracensis*) occurs year round in California, but in two primary seasonal roles: currently as a very local breeder in the northeastern interior and as a winter visitor (early October to mid-April) on the coast and in the Suisun Marsh region (Shuford et al. 2008). In addition, the yellow rail is strongly associated with shallowly flooded emergent wetlands, most commonly sedge (*Carex* spp.) meadows (Shuford and Gardali 2008). Their populations are believed to be limited by loss or degradation of wetland habitat due to drainage, altered hydrology, and fire suppression, factors that have often resulted in encroachment of shrubs into sedge meadows and change in vegetative cover (Austin and Buhl 2013).

In addition to having no suitable habitat for this species, the Green-Horse project lies well outside its known or expected range. Therefore, no effects from project activities are expected and no further analysis will be conducted.

Determination: No Effect; because the project is outside this species' range in addition to having no suitable habitat.

Northern Red-Legged Frog

The northern red-legged frog (*Rana aurora*) inhabits quiet pools of streams, marshes, and occasionally ponds. It occurs along the Coast Ranges from Del Norte County to Mendocino County, usually below 3,950 feet in elevation (CDFG 2008). This species was once known as simply the red-legged frog and had a range extending the length of the state in the Coast Ranges and including portions of the Sierra Nevada and Cascades ranges. However, the Sierra Nevada and Cascades populations, and populations in the Coast Ranges south of a narrow zone of overlap in southern Mendocino County, are now considered to be a separate species (*Rana draytonii*), the California red-legged frog (Shaffer et al. 2004) and it is listed on the USFWS Endangered Species List as Threatened.

The Green-Horse project area is outside of the range of the northern red-legged frog (CDFG 2008, Shaffer et al 2004). Therefore, no effects from project activities are expected and no further analysis will be conducted.

Determination: No Effect; because the project is outside of this species' range.

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Patricia Johnson
Wildlife Biologist
USDA Forest Service
VMS Enterprise Unit
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Literature Cited in Wildlife Addendum

USDI Fish and Wildlife Service. 2012. Final Revised Critical Habitat for the Northern Spotted Owl (*Strix occidentalis caurina*). U.S. Department of the Interior. Region 1, Portland, OR November 2012.

Fringed myotis:

Barclay, R.M.R. 1991. Population structure of temperate zone insectivorous bats in relation to foraging behavior and energy demand. *Journal of Animal Ecology* (1991) 60: 165-178.

Buchalski M.R., Fontaine J.B., Heady P.A. III, Hayes J.P., Frick W.F. 2013. Bat Response to Differing Fire Severity in Mixed-Conifer Forest California, USA. PLoSONE 8(3): e57884. doi:10.1371/journal.pone.0057884

Christy, R.E. and S.D. West. 1993. Biology of Bats in Douglas-Fir Forests. USDA Forest Service, Pacific Northwest Research Station, Portland, OR.

Humphrey, S.R. 1975. Nursery roosts and community diversity of nearctic bats. Journal of *Mammalogy* 56:321-346.

Keinath D.A. 2004. Fringed myotis (*Myotis thysanodes*): A Technical conservation Assessment. Prepared for the USDA Forest Service, Rocky Mountain Region. Available online: http://www.fs.fed.us/r2/projects/scp/assessments/fringedmyotis.pdf.

Keinath, D.A. 2003. Species Assessment for fringed myotis (*Myotis thysanodes*) in Wyoming. Prepared for the US Department of the Interior, Bureau of Land Management, Wyoming State Office, Cheyenne Wyoming.

Lewis, S.E. 1995. Roost fidelity of bats: A review. *Journal of Mammalogy* 76:481-496.

Lacki, M.J. and M.D. Baker. 2007. Day roosts of female fringed myotis (*Myotis thysanodes*) in xeric forests of the Pacific Northwest. *Journal of Mammalogy* 88 (4): 000-000.

Pierson E.D. and W.E. Rainey. 2007. Bat distribution in the forested region of northwestern California. Report prepared for the California Department of Fish and Game. Contract Number FG-5123-WM. Sacramento, California, USA.

Weller, T.J. and C.J. Zabel. 2001. Characteristics of fringed myotis day roosts in northern California. *Journal of Wildlife Management* 65:489-497.

Western Bumble Bee:

Evans, E., R.W. Thorp, S. Jepsen, and S. H. Black. 2008. Status Review of Three Formerly Common Species of Bumble Bee in the Subgenus Bombus. The Xerces Society. (http://www.xerces.org/wp-content/uploads/2009/xerces_2008_bombus_status_review.pdf; accessed July 17, 2013)

Hatfield, R. G. and G. LeBuhn. 2007. Patch and landscape factors shape community assemblage of bumble bees, Bombus spp. (Hymenoptera: Apidae), in montane meadows. *Biological Conservation* 139: 150-158.

Hatfield R., S. Jepsen, E. Mader, S.H. Black and M. Shepherd. 2012. Conserving Bumble Bees: Guidelines for Creating and Managing Habitat for America's Declining Pollinators. 32pp. Portland, Oregon. The Xerces Society for Invertebrate Conservation.

Koch, J., J. Strange, P. Williams. 2012. Bumble bees of the Western United States. A publication of the USDA Forest Service, Pollinator Partnership and USGS. 144pp.

Macfarlane, R. P., K. D. Patten, L. A. Royce, B. K. W. Wyatt, and D. F. Mayer. 1994. Management potential of sixteen North American bumble bee species. *Melanderia* 50: 1-12.

Rao, S. and W. P. Stephen. 2007. *Bombus* (*Bombus*) *occidentalis* (Hymenoptera: Apiformes): in decline or recovery? *The Pan-Pacific Entomologist* 83: 360-362.

Rao S.R., W.P. Stephen, C. Kimoto, and S.J. DeBano. 2011. The Status of the 'Red-Listed' *Bombus occidentalis* (Hymenoptera: Apiformes) in Northeastern Oregon. *Northwest Science*, 85(1):64-67. 2011. Northwest Scientific Association.

Thorp, R. W., D. S Horning and L. L. Dunning. 1983. Bumble bees and cuckoo bumble bees of California (Hymenoptera: Apidae). Bulletin of the California Insect Survey 23: viii.

Thorp, Robbin. Personal Communication July 2013.

Xerces Society. Bumble bees: western bumble bee (*Bombus occidentalis*). Profile prepared by R. W.

Thorp, E. Evans and S. H. Black. http://www.xerces.org/western-bumble-bee/.

Yellow Rail:

Austin, J. and D. A. Buhl. 2013. Relating Yellow Rail (*Coturnicops noveboracensis*) Occupancy to Habitat and Landscape Features in the Context of Fire. *Waterbirds* 36(2): 199-213, 2013

Shuford, W. D., and Gardali, T., editors. 2008. California Bird Species of Special Concern: A ranked assessment of species, subspecies, and distinct populations of birds of immediate conservation concern in California. *Studies of Western Birds* 1:163–166, 2008.

Northern Red-Legged Frog:

CDFG 2008. Morey, S. and H. Basey. 2008. California Dept. of Fish and Wildlife. Life History and Range map of the northern red-legged frog.

Shaffer, H. B., G. M. Fellers, S. R. Voss, J. C. Oliver and G. B. Pauly. 2004. Species boundaries, phylogeography and conservation genetics of the red-legged frog (*Rana aurora/draytonii*) complex. Molecular Ecology 13:2667-2677.